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COMPONENTS IDENTIFIED IN ENERGY-RELATED WASTES AND EFFLUENTS

by

J.E. Gebhart and M.M. McKown
Gulf South Research Institute
P.O. Box 26518
New Orleans, Louisiana 70126

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Project Officer

Ann L. Alford
Analytical Chemistry Branch
Environmental Research Laboratory
Athens, Georgia 30613

ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ATHENS, GEORGIA 30613

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A state-of-the-art review of the characterization of solid eastes and aqueous effluents generated by energy-related processes was conducted. The reliability of these data was evaluated according to preselected criteria or sample source, sampling and analytical methodology, and data source. Data on the following activities were included: coal strip mining, oil refineries, oil shale operations, coal-fired power plants, coal liquefaction processes, coal gasification processes, and geothermal energy production. Using the information collected during this review, areas of inadequate data were identified and sampling sites were selected. Sites were selected to include as least one plant in each of seven energy-related activities. Energy research sites in the Western Energy Resource Development sector were considered as prime sites. Samples were collected from 49 sites. Samples were prepared by using the necessary sample-preparation, clean-up, and preconcentration procedures. Purgeable (volatile) and extractable (semi-volatile) organic components were identified and quantified by gas chromatography/mass spectrometry/data system techniques. Samples were analyzed for mercury by using flameless atomic absorption spectrophotometric procedures, while approximately 70 other elements were determined by spark source mass spectrometry.

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FOREWORD

Nearly every phase of environmental protection depends on a capability to identify and measure specific pollutants in the environment. As part of this Laboratory's research on the occurrence, movement, transformation, impact, and control of environmental contaminants, the Analytical Chemistry Branch develops and assesses techniques for identifying and measuring chemical constituents of water and soil.

Efforts to achieve our national goal of energy independence will require increasing utilization of our country's vast domestic coal reserves as well as resources available from oil shale and tar sands. Production of synthetic fuels using coal gassification, coal liquefaction, oil-shale retorting, and other processes offers promise of meeting many of our energy needs. Of collateral importance with the production of energy, however, is assuring that toxic or undesirable substances in energy process effluent are identified and properly controlled to prevent human health problems and reduce environmental degradation. This state-of-the-art review is provided as an aid to researchers concerned with the environmental effects of energy-related activities.

David W. Duttweiler
Director
Environmental Research Laboratory
Athens, Georgia

ABSTRACT

A state-of-the-art review of the characterization of solid wastes and aqueous effluents generated by energy-related processes was conducted. The reliability of these data was evaluated according to preselected criteria of sample source, sampling and analytical methodology, and data source. Because relevant data were being generated concurrent with this research effort, this review was updated regularly throughout the performance period. Reports of previous and ongoing research were collected and summarized, and this information was categorized according to energy-related activity. Data on the following activities were included: coal strip mining, oil refineries, oil shale operations, coal-fired power plants, coal liquefaction processes, coal gasification processes, and geothermal energy production. The state-of-the-art review is available under a separate cover (EPA 600/7-79-255).

Using the information collected during this review, areas of inadequate data were identified and sampling sites were selected. Sites were selected to include at least one plant in each of the seven energy-related activities. Energy research sites in the Western Energy Resource Development (WERD) sector were considered as prime sites. Samples were collected from 49 sites. Samples were prepared by using the necessary sample-preparation, clean-up, and preconconcentration procedures. Purgeable (volatile) and extractable (semi-volatile) organic components were identified and quantified by gas chromatography/mass spectrometry/data system techniques. Samples were analyzed for mercury by using flameless atomic absorption spectrophotometric procedures, while approximately 70 other elements were determined by spark source mass spectrometry.

This report was submitted in fulfillment of Contract No. 60-03-2487 by Gulf South Research Institute under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period November 15, 1976, to November 14, 1979, and work was completed as of December 15, 1979.

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SECTION 1

INTRODUCTION

The need for energy sources that are both reliable and safe, coupled with the national goal of energy independence, has generated increasing activity in the technology of energy production. Technologies are being developed and used to exploit this country's reserves of oil, coal, and geothermal fluids and gases. Energy production processes must be assessed from the standpoint of cost effectiveness and of potential health and environmental effects.

Use of domestic oil supplies is increasing as a matter of policy and economics. Fuel generated from refining conventional petroleum crude oil feed stocks will continue to be an important source of energy for some years to come. However, much emphasis has been placed on coal conversion processes since U.S. coal reserves are estimated to comprise more than 80 percent of the total available coal, oil, and gas. Furthermore, these supplies are sufficient to support production of a large amount of synthetic fuels (1). Over 230 billion tons of coal are accessible by conventional mining techniques. Technological advances are increasing the total amount of usable coal and making additional reserves available in the form of oil shale and tar sands. Development of geothermal resource areas offers the potential for the extraction of thermal and electrical energy.

Exploitation of energy sources by current technologies and the certainty of active developmental programs in the future pose a real threat to environmental quality. To preserve environmental quality, control technologies must be developed simultaneously with the energy-producing technologies. The nature and extent of the control processes are based on 1) a knowledge of the constituents in the crude fuel feedstocks, 2) an understanding of the conditions and chemical reactions involved in the finished fuel producing processes, and 3) a knowledge of the components in the process streams from these energy-related activities. Generation of such data could also result in identification of potentially useful byproducts of the fuel-producing technologies.

Of the seven energy-related activities surveyed in this program, the oil refining process is the oldest and the most widely used. In the refining process, the various components in crude oil are separated and converted to usable forms of fuel (heating fuel, gasoline, etc.), as well as to the feedstocks for various petrochemical processes. The details of the refining process vary from one major oil producer to another and even from one refinery to another.

The existence of abundant coal deposits in the United States has generated much interest in this fuel as the energy source of the future. Surface coal mining, or strip mining, as a method of obtaining coal has become particularly attractive from an economic perspective. Surface mining involves making a trench or box cut through the overburden to expose the coal deposit, which is then removed. The first cut may be extended to the limits of the property or the deposit. As each succeeding cut is made, the spoil, or overburden, is deposited in the cut just excavated. The final cut leaves an open trench as deep as the thickness of the overburden plus the recovered coal, bounded on one side by the last spoil bank and on the other by the undisturbed highwall. The primary environmental concern associated with strip mining is the potential for groundwater contamination due to the leaching of hazardous materials from the spoil banks. Surface coal mining has been used in all areas of the country where coal deposits are shallow enough for this technique to be applicable.

One of the areas in which coal is replacing oil as a major energy source is as a fuel for firing boilers to generate steam and produce electricity. Coal-fired boilers may be broadly classified as stoker or pulverized coal plants. These firing systems are characterized by typical firing temperatures of 1500°F (~815°C) and 2500°F (~1370°C), respectively, and represent 20 and 80 percent, respectively, of the nation's coal-fired generating boilers. The combustion process results in enrichment of various trace impurities in the coal. The process streams of a coal-fired power plant contain components characteristic of the coal itself and of the complex chemical reactions which comprise the combustion process.

Several new coal-conversion processes are being developed as potential energy sources. Processes for converting various types of coal to synthetic liquid fuels are steadily being improved. Emphasis is on the production of fuels suitable for firing industrial and electric utility boilers and on synthetic crude oils for upgrading to liquids for use in transportation and home heating. Three processes are in the pilot-plant phase. Collectively, these three approaches are known as second-generation coal liquefaction processes, a category that includes solvent refined coal (SRC), H-coal, and donor solvent processes. The Department of Energy (DOE) is supporting an SRC pilot plant located at Fort Lewis, Washington, where the operating contractor is Pittsburgh and Midway Coal Mining Company. A smaller SRC plant is operated at Wilsonville, Alabama, by Southern Company Services, Inc., with support of DOE and the Electric Power Research Institute. DOE and a consortium of industrial sponsors are supporting the design, construction, and operation of a very large H-coal pilot plant at Catlettsburg, Kentucky. Ashland Synthetic Fuels, Inc., operates the plant. Under a cooperative agreement, DOE and Exxon Research and Engineering Company, together with other industrial partners, are supporting development of the donor solvent process. The plant, located in Baytown, Texas, is operated by the Carter Oil Company. Third-generation processes provide technical backup and significant potential improvements over second-generation processes. Some of these processes include partial liquefaction by direct hydrogeneration (flash liquefaction), flash pyrolysis, hydrocracking with a molten zinc chloride catalyst, a multistage ebullient-bed catalytic reactor, the Synthoil process, and the fluid-bed process for selective conversion of methanol to gasoline.

The conversion of coal to combustible gases promises to become an important method of coal recovery. The coal gasification process involves a complex series of chemical reactions but can be described simply as the heating of coal in the presence of gasifying agents such as oxygen and steam. If the gasification process is carried out with the coal in place underground, it is called _in situ_ gasification. _In situ_ gasification can be accomplished without the construction of underground mines, and it may make the recovery of very deep coals economically attractive.

Both high- and low-Btu gasification processes are being developed by DOE. High-Btu gas can be distributed economically to the consumer in the same pipeline systems now used to carry natural gas. Low-Btu gas, the least expensive of the gaseous fuels produced from coal, can be used economically only on site, either for electric power generation or by industrial plants. DOE and the American Gas Association are jointly funding the development of a number of processes for converting coal to high-Btu gas. These processes are in the pilot-plant phase. Among these are the CO_2 acceptor, Bigas, Hygas, and Synthane processes. These operations are being evaluated to obtain data for the conceptual design of commercial-size plants for each candidate process. Low-Btu gas, with a heating value of 120 to 500 Btu/ft^3, is an economical fuel for power generation in combined gas-steam turbine power cycles and as an industrial gaseous fuel. On an equivalent Btu basis, production of low-Btu gas is less complex and less expensive than the high-Btu product. DOE is sponsoring the concurrent development of several basic types of gasifiers for production of low-Btu gas. These include fixed bed, fluidized bed, and entrained flow processes. Since low-Btu gas must be generated at its point of use, actual integration of production and end-use application is a critical element in establishing its utilization. Major efforts are under way to develop the industrial and utility applications.

Development of the _in situ_ gasification process supported by DOE includes the Hanna experiments being conducted by the Laramie Energy Technology Center, the Hoe Creek experiments carried out under the direction of Lawrence Livermore Laboratory, and the Morgantown Energy Research Center's underground gasification project for eastern bituminous coals. The major environmental concerns associated with _in situ_ gasification processes are the potential for groundwater contamination and the fact that a cavity is produced by the extraction of gasified coal, making subsidence a potential problem.

Oil-shale retorting is another of the new technologies being developed to utilize this country's energy reserves. Above-ground retorting processes which have reached the stage of industrial interest in the United States can be divided into three categories based on the manner in which heat is supplied to the retorting process. The Tosca II process, which is driven by recycled hot solids, is the oldest of the oil-shale technologies. This process is probably the closest to industrial scale-up, producing 50,000 billion barrels (bbl) per day. The Paraho processes, located at Anvil Points, Colorado, are gas combustion and hot inert gas retorting processes. Using a kiln invented by Development Engineering, Inc., a pilot scale retort using this process is capable of extracting oil from raw shale at a rate of 200 bbl/day. The Union Oil Process uses hot inert gas to supply heat to the retort. A pilot plant using this process has been constructed on Parachute

Creek in Colorado. This facility is capable of producing 7,800 bbl of shale oil per day. Both modified and "true" in situ retorting processes are also under development. A modified process supported by the Occidental Petroleum Corporation is approaching the commercial scale-up stage. True in situ retorting processes are being evaluated both by the federal government and by the private sector. Again, in situ processing eliminates the necessity and expense of mining operations; however, groundwater contamination is a potential problem.

Geothermal resources as a energy source in the production of electricity has been investigated. Geothermal resources include steam-dominated sources, liquid-dominated sources, geopressurized sources, and dry (hot rock) sources. There are numerous geothermal resource areas in the United States, located primarily in the western part of the country. Some have been designated known geothermal resource areas (KGRAs), with demonstrated potential for the extraction of thermal or electrical energy. A thermodynamic power cycle is the process employed to extract and utilize geothermal energy to produce electricity. The methods used in the power cycle to produce steam or other vapor to drive a turbine depend on the characteristic of the geothermal fluid. The environmental concern associated with geothermal energy processes involves reclamation and disposal of the spent geothermal fluid.

Many of the processes described here show promise as energy sources. Several are in or are approaching the stage of commercial production. It is important that the impact of these processes on the environment be controlled. To aid in the development of control technology, this program was designed to characterize the components in the wastes and effluents of several energy-related activities.

SECTION 2

CONCLUSIONS

The data collected during the state-of-the-art review were evaluated according to the following criteria: 1) sample source, 2) completeness of sampling design, 3) sampling procedures, 4) sample preparation procedures, 5) analytical procedures, and 6) completeness of analysis. Information gathered in this review indicates that characterization of the inorganic components of energy-related wastes has received more attention than the identification of the organic components. However, the research conducted to date on the analysis of these effluents is insufficient to assess the potential environmental impact of these energy-related processes.

Analysis of the waste and effluent samples collected from the seven energy-related activities surveyed in this program revealed their extreme complexity. It became evident that identification of organic components of these samples required analysis with a high-resolution glass capillary gas chromatography/mass spectrometry/data system. In some cases, derivatization techniques were required to obtain acceptable resolution of the individual organic compounds.

Characterization of these compounds resulted in the identification of a variety of chemical classes including carboxylic acids and pyridines in the effluents from oil shale retorting; thiophenes, nitriles, alkyl phenols from *in situ* coal gasification; and alkylbenzenes and a variety of unsaturated hydrocarbons in coal liquefaction wastes.

Standard techniques were used in the preparation and analysis of these samples. The purge-and-trap technique is applicable to the determination of organic compounds which have a water solubility of less than 2 percent and boiling point of less than 150°C. The extraction scheme used to prepare samples for semivolatile analysis is applicable to compounds which are solvent-extractable and amenable to gas chromatographic separation. Compounds which are highly water soluble or which boil at temperatures greater than 260°C were not determined by these procedures. Procedures used in the analysis of these samples for elemental components, spark source mass spectrometry and flameless atomic absorption spectrometry, were chosen to provide maximum information for each analysis. These techniques are capable of providing data on the element composition of these samples at the parts-per-billion level.

SECTION 3

RECOMMENDATIONS

Several aspects of this research effort should be continued to characterize the components of energy-related wastes and effluents. First, the state-of-the-art summary of completed programs and research in progress should be continued. The collection of this information provides a valuable data base for researchers to use in the design of further analytical studies. Second, efforts to characterize effluents and wastes from energy-related processes should be continued and expanded. The inclusion of nonvolatile and nonextractable materials in these characterization schemes should be considered. Specifically, it would be of interest to sample and analyze the process streams and final effluents of those technologies which are approaching commercial scaleup. This approach would provide valuable information on the efficacy of the waste-treatment procedures. Finally, there is need for the involvement of the life sciences, particularly toxicology, in these programs. Total characterization of the wastes and effluents from energy-related activities is an important effort when very little is known about the nature of these liquid and solid byproducts. As more information is generated, however, it should be possible to identify specific compounds or classes of compounds related to certain energy-producing activities which, because of their stability or toxicity, represent a threat to the environment and/or the health of a given population. Then, monitoring the effluents of a certain process for only those materials known to result from that process could be accomplished in a timely and cost effective manner.

SECTION 4

STATE-OF-THE-ART REVIEW

INTRODUCTION

A state-of-the-art review was conducted to determine which energy-related wastes and effluents had been characterized. Sources of this information included the open literature, government reports, and contacts with appropriate researchers. Emphasis was placed both on work that had been completed and on work that was still in progress. The purpose of this review was to determine which of the seven energy-related activities involved in this research effort had been investigated to identify specific components in their wastes and effluents and to what extent these investigations had been carried out. Gaps in the existing and anticipated data base on the characterization of energy-related wastes and effluents were identified and served as a guide in designing this research effort.

Search and Retrieval Procedures

The open literature, government reports, and contacts with researchers were used as sources of information in the state-of-the-art review. The review of the open literature was carried out by manual and computer-assisted search of Chemical Abstracts and other data bases such as MEDLINE and TOXLINE. Government documents were searched by using the services of the Smithsonian Science Information Exchange Inc. (SSIE). These sources provided reports of recently completed government supported programs, as well as information on research in progress. Contacts with individuals involved in analyzing energy-related effluents were made by telephone or mail. Often, these individuals were able to provide reprints or other pertinent information including possible sample sources.

Evaluation Criteria

The data collected during the state-of-the-art review were evaluated according to the following criteria: 1) sample source, 2) completeness of sampling design, 3) sampling procedures, 4) sample preparation procedures, 5) analytical procedures, and 6) completeness of analysis.

STATE-OF-THE-ART ASSESSMENT

The abstracts of literature, research reports, and current projects that were retrieved during this review were published previously (2). This material has been classified according to energy-related activity and is summarized briefly in the following pages.

Coal Strip Mining

Much research on the effluents from coal-mining operations has been performed in support of applications to discharge wastes or for inclusion in environmental impact statements. Consequently, these efforts have focused on characterizing acid mine drainage and spoil bank leachate for general water quality parameters such as pH, total organic carbon, total phosphate, dissolved solids, and certain metals. Some work has been done to identify specific tracer materials to permit monitoring of the toxic species as they move through the aquifers into a water supply (3). In one current program, research is being performed to determine the analytical sensitivities necessary to study trace elements in mine spoils (4). Additional efforts have been directed toward evaluating abatement procedures. However, these studies also emphasize water analysis for metals and bulk water quality parameters (5,6).

Some research involving coal mining has addressed the characterization of the particulate matter resulting from these operations. One study reports the levels of minor and trace elements in coal particles of various sizes (7). This analysis was performed by spark source mass spectrometry (SSMS). In a similar investigation, coal particles of various sizes from several sources were analyzed for organic materials by using mass spectrometric techniques (8). In general, however, there has not been a thorough characterization of the liquid and solid wastes resulting from coal mining operations; nor has there been a serious attempt to correlate the components found in these effluents with the composition of the coal, the characteristics of the overburden, or the process steps in coal mining.

Oil Refineries

A significant amount of research has been carried out or is under way to identify the components in liquid effluents from oil refining operations. Many of these programs focused on the organic compounds associated with these wastes. Several of these studies (9-13) have applied gas chromatographic/mass spectrometric (GC/MS) procedures supplemented by nuclear magnetic resonance (NMR) techniques to these analyses and have examined the liquid effluents at various stages of treatment prior to final discharge. Reports of these programs include details of the sample preparation and analysis procedures, and mass spectra of the compounds identified are being collected for inclusion in computer libraries. Compounds identified are to be used by other programs for surveillance and analysis, to evaluate treatment effectiveness, and to set effluent criteria. The details provided in the reports and other outputs of these programs are available to researchers and should be applied to the characterization of a larger number of refineries before conclusions are drawn about the environmental impact of the oil refining industry.

Oil Shale Operations

Much of the research effort directed toward characterizing the liquid and solid wastes associated with oil shale retorting process has emphasized the analysis of these media for metals. Some of these studies involving aqueous wastes have addressed the problems associated with collection, storage (14), and analysis (15) of these complex samples. The major emphasis on solid wastes has been the leachability of trace metals from spent shale (16). The leaching of organic material from in situ spent shale has also been studied (17); however, specific organic compounds were not identified in this work. Two programs in progress (18,19) are designed to identify the organic materials in retorting process waters and in spent shale leachate. Much of the reported data, however, emphasizes determination of specific compounds (e.g., polynuclear aromatics) in these effluents rather than screening efforts.

Although some data are available on organic compound identification in retorting effluents (20), there is a need for more effort in this area. These studies should address both in situ and surface processing operations. Also, the programs should be designed to monitor effluents at various stages throughout the retorting process to determine if the waste treatment procedures need to be graduated to handle variations in contamination levels. The proceedings of the Environmental Protection Agency Oil Shale Symposium: Sampling, Analysis, and Quality Assurance, held in Denver, Colorado, on March 26-28, 1979, may provide some of this information.

Coal-Fired Power Plants

Current programs and technical reports concerning analysis of liquid and solid effluents from coal-fired power plants deal primarily with the analysis of particulate materials for trace metals and certain anions. Little information is available on the identification of the components in the aqueous streams. Investigations of the organic components associated with the particulates have concentrated on the detection of specific compounds or classes of compounds such as polynuclear aromatics. While a significant effort has been made to evaluate the environmental and health effects of the effluents of coal-fired power plants, much of it has been directed toward determining the physical and organic characteristics of particulate matter. Therefore, efforts to provide data on the organic materials associated with these solid effluents and to characterize both the organic and inorganic constituents in the liquid effluents are much needed. With this information it might be possible to correlate the identity and levels of certain pollutants with the source of the coal or with the stage of the combustion process.

Coal Liquefaction Plants

Wastewater generated from coal liquefaction operations has been studied to determine the environmental impact of discharging this effluent and the suitability for reuse within the plant. Some of these programs have emphasized the use of GC/MS, high-pressure liquid chromatography, infrared, and laser Raman spectroscopic (21-24) techniques to identify organic compounds in these effluents. Trace metals have also been determined in these samples, and efforts have been made to correlate the types and levels of contaminants with the source of the coal used in the process and with the various steps in the process itself.

Since several of the coal liquefaction processes are approaching the commercial scale-up stage, much attention has been directed toward evaluating the effectiveness of waste-treatment procedures (25). The processes which have been studied most thoroughly in this regard include Synthoil, H-coal, and SRC.

Coal Gasification Operations

The effluents from in situ and surface coal gasification operations are perhaps the best characterized of the energy-related wastes. Considerable effort has been directed toward identification of organic and inorganic components in the groundwater in the vicinity of the in situ processes (26-28) and toward the transport of these contaminants (28,29) through the natural aquifers. Studies have also been conducted to characterize the aqueous waste of surface gasification operations. The coal conversion processes which have received the most attention are the Synthane process (30) and the Lurgi coal gasification process.

While the effluents of in situ coal gasification operations have been characterized during and immediately after the "burn," extended investigations are needed to determine the long-term effects of these underground combustion products. These studies should include the identification of components in the groundwater of the aquifers connected to a gasified coal seam by cavity roof and in areas where aquifers may be affected by post-burn subsidence.

One of the major aspects of surface gasification operations that should be researched is the possible leaching of materials from the spent coal after it has been discarded. Such discarded coal may be as significant a source of pollution as the process wastes, and it should be disposed in an environmentally safe manner.

Geothermal Energy Production

There is little information available on the identification of the components in geothermal fluids and process effluents. Undoubtedly, this reflects the early stage of development of this energy resource. Some data are available on the effects of utilizing geothermal sources on the air quality (31,32) in the immediate vicinity of the operation. However, much of the technical effort has been directed toward demonstrating the feasibility of exploiting this country's geothermal resources from both an engineering and cost perspective.

SECTION 5

SAMPLES AND SAMPLING PROCEDURES

INTRODUCTION

While the state-of-the-art review and site selection for sample collection were conducted concurrently, information gathered during the review was used to identify gaps in existing data on characterization of energy-related wastes and effluents and to identify operations from which solid and liquid waste samples might be obtained. In choosing sites for sample collection, priority was given to the energy-related activities in the Western Energy Resource Development sector of the United States. Attempts were also made to obtain samples from operations on which some data had been generated by other research efforts. In this manner, those investigations would be complemented by this program.

Difficulties were encountered in obtaining solid samples from several of the energy-related activities. Some of the processes simply did not generate significant quantities of solid wastes (e.g., geothermal sources), and some operations were not equipped with a mechanism for collecting samples of this type (e.g., in situ gasification). When these problems arose, additional liquid samples were obtained. It was not always possible to arrange cooperative agreements to obtain samples from commercial operations. Therefore, most of the analyses carried out were of samples collected from operations supported or sponsored by a governmental agency. A list of the effluent samples collected and characterized during this program is presented in Table 1.

All samples were collected in a manner to insure that they were representative of the process stream or effluent being characterized. Precautions were taken in preserving and shipping the samples to guarantee their integrity.

SAMPLE SOURCES

Coal Strip Mining

The WERD sector of the United States is rich in coal deposits, particularly in Wyoming, Montana, and Colorado. Other areas of coal-mining activities include the eastern states of West Virginia, Kentucky, Pennsylvania, and Tennessee. As the cost of energy rises, recovery of coal in other parts of the country becomes more economically feasible. America's great reserves of coal dictate that this fuel stock will continue to grow in importance as an energy source.

Initial efforts to obtain effluent samples from coal-mining operations were frustrated by the reluctance of private industry to participate in this program. The Effluent Guidelines Division of the Environmental Protection Agency (EGD-EPA) had collected aqueous effluent samples from 20 coal mines for analysis for Consent Decree compounds (33). Analysis of these samples under this program was mutually beneficial for the following reasons:

1. These samples were inaccessible otherwise.
2. The sampling locations were widely distributed geographically and thus were representative of coal mining operations in general.
3. Data were exchanged and where appropriate can be compared.
4. Duplication of effort and unnecessary expense were avoided.

Effluents from coal mining operations obtained through EGD were collected by Versar Engineering both from surface and deep recovery processes. Field blanks were included with each sample lot.

Oil Refineries

Difficulties were also encountered in obtaining effluent samples from oil refineries. Since this is the oldest and most commercialized process for converting crude fuel stock into usable energy supply, virtually all of the activity in this area is being conducted by private industry. Samples collected by EGD were made available for characterization during this program. These samples were obtained from several large commercial refineries in geographically diverse locations.

Oil Shale Operations

Oil shale occurs throughout much of the United States; the WERD sector deposits are located primarily in Colorado, Wyoming, and Utah as shown in Figure 1. Much of the activity in oil shale operations is in the demonstration or pilot plant stage of development and is sponsored by federal agencies or by federal agencies in cooperation with private industrial consortia.

Some effluent samples associated with oil shale retorting were obtained from the Paraho retorts at the Anvil Points Facility near Rifle, Colorado. This surface-processing operation is located in a region of extensive oil shale deposits along the Colorado River. A map of the area is presented in Figure 2. The facility is operated by the Paraho Development Corporation (PDC), and samples were obtained through a cooperative agreement with Development Engineering Incorporated, a subsidiary of PDC. Samples collected from this facility included product water, mine-dust control water, and environmental sampling well water.

A second set of aqueous samples was collected through the oil shale research program at Lawrence Livermore Laboratory (LLL). This program is designed to provide technology for the development of modified in situ oil shale processes, including retorting and rubbing, and to provide complementary support to joint industry/government projects, leading to the commercialization of modified or rubble in situ processing. A schematic of the LLL retort, a 6-ton adiabatic unit, is presented in Figure 3.

A retorting experiment was carried out with this unit from November 6-10, 1978. Beginning at approximately 26 hr into the experiment, samples of aqueous product effluent were collected every 4 hr. Analysis of these samples presents an excellent profile of the changes in the identity and the levels of contaminants which occur during a retorting process.

Coal-Fired Power Plants

Effluents from coal-fired power plants were also difficult to obtain. Again, because these plants are and have been operating on a commercial basis, they are, in general, privately owned. Private industry was reluctant to provide samples for an EPA funded program. Samples were obtained through EGD. A total of 15 coal-fired power plants were sampled by E.H. Richardson Associates, Inc. Samples for analysis of semivolatile components were extracted by E.H. Richardson, and the extracts were analyzed under this program. Samples for volatile organic analysis and for metals analysis were collected as grab samples over a period of time. Again, the procedure for obtaining samples offers the advantages of generating data on geographically dispersed plant locations and of avoiding duplication of effort and unnecessary expense.

Additional samples from coal-fired power plants became available through Atomics International Division of Rockwell International in Conoga Park, California. These samples included fly ash samples from coal-burning power plants in the North Dakota area of the WERD sector and samples of dry scrubber sludge generated from a desulfurization process on fly ash.

Coal Liquefaction

Final effluent samples were obtained from the solvent refined coal pilot plant in operation at Ft. Lewis, Washington, near Tacoma. The goal of this operation is to establish in a pilot plant the conversion of coal to low-ash, low-sulfur fuels. This work includes process development, evaluation of process equipment, and bench-scale testing to provide data for guidance of pilot plant operations and for use in cost studies and commercial scale process designs. A major corollary objective is the production of sufficient volumes of SRC products for meaningful consumer testing.

Coal Gasification Plants

Effluent samples were obtained from several coal gasification operations. Lawrence Livermore Laboratory is involved in in situ gasification experiments in Wyoming, about 20 miles south of the town of Gillette. This region is a sparsely populated area of gently rolling, semi-arid rangeland. It forms a part of the Powder River basin of northeast Wyoming and southeast Montana - a region that may contain half a trillion tons of coal suitable for in situ processing. The Hoe Creek I gasification experiment was conducted by LLL in October 1976. The gasification proceeded for 11 days. An undesirable distribution of permeabilities caused a limited resource recovery, and work was performed in the laboratory to develop a better model for prediction of permeabilities produced by explosive fracturing. In the Hoe Creek II experiment, 20 times as much coal was gasified as in Hoe Creek I. On this site, 9 wells were constructed specifically to monitor the groundwater in and around the burn zone. The location of the water sampling wells for the Hoe Creek II experiment is shown in Figure 4. Baseline water samples were obtained in August and again in early October 1977 prior to gasification. After the experimental burn, samples were collected and analyzed for this program over the course of a year. The information generated by the characterization of these samples provides a unique picture of the short-term effect of in situ gasification on the surrounding groundwater.

Additional aqueous samples were obtained from the site of the Hanna III in situ gasification experiment conducted by the Laramie Energy Technology Center (LETC). This test was designed to determine the environmental impact on groundwater associated with gasification technology as well as to offer further characterization of the in situ process. Fourteen wells were constructed to monitor the movement of pollutants through the groundwater. A schematic of the gasification area and of the location of the sampling wells is shown in Figure 5. Samples were collected for analysis under this program both during and after the gasification.

Two gasifier solid samples were obtained from the Pittsburgh Energy Technology Center (PETC). The coal gasification program at Grand Forks Energy Technology Center (GFETC) provided two bulk samples for this study. The operation of GFETC is the only process using lignite coal as a gasifier feed stock. A liquor and a product tar were collected from the slagging gasifier at GFETC.

Geothermal Energy Production

There are numerous geothermal resource areas in the WERD sector of the United States as illustrated in Figure 6. The reservoir characteristics of the geothermal areas in the WERD Sector, in Geysers, California, and in the Gulf Coast region are presented in Table 2. Effluent samples were obtained from two geothermal sources via participation in a round-robin study being conducted by Battelle Northwest Laboratories under contract to the Energy Research and Development Administration. The purpose of this study was to identify areas of inadequate information and analytical methodology for the characterization of geothermal brines. One set of samples was obtained from the East Mesa Geothermal Test Site, Imperial Valley, California. A second set of samples was collected from the Woolsey Well No. 1 at the Salton Sea in Southern California. Both of these sources are liquid-dominated, natural-pressured geothermal resource areas.

SAMPLING PROCEDURE

For each sample, separate fractions were collected for each analysis. The samples were collected and preserved as follows:

- Aqueous Samples
  - Semivolatile Organic Analysis
    - Containers: glass with Teflon liners
    - Volume: 2 x 2 liters
    - Collection method: grab or composite of grabs collected over a 2 to 8 hr period
    - Storage: cool to 4°C

Volatile Organic Analysis
- Containers: glass with Teflon-lined septa and screw tops or crimp tops
- Volume: 2 x 125 ml
- Collection method: grab samples collected with no headspace (reverse meniscus) sealed immediately
- Storage: cool to 4°C

Mercury Analysis
- Containers: wide-mouth polyethylene
- Volume: 2 x 250 ml
- Collection method: grab or composite of grabs collected over 2 to 8 hr
- Storage: adjust pH to 2 with Ultrex HNO_3 cool to 4°C

Metals Analysis
- Containers: polyethylene
- Volume: 2 x 250 ml
- Collection method: grab or composite of grabs collected over 2 to 8 hr
- Storage: cool to 4°C

Solid Samples
Tar or Waste Stream Sediment
- Container: polyethylene
- Amount: 2 x 500 g
- Collection method: loosen solid material with spatula or trowel and fill sample container
- Storage: cool to 4°C

Waste Stream Suspension
- Container: polyethylene
- Amount: 2 x 500 g
- Collection method: decant supernatant and pour slurry into container
- Storage: cool to 4°C

All samples were shipped from the collection site to the laboratory by air freight to insure quick delivery. Samples were then stored at 4°C until analysis. In general, samples were stored no more than two weeks before analysis or extraction.

SECTION 6

ANALYTICAL PROCEDURES

INORGANIC ANALYSIS

Spark Source Mass Spectrometry

Analysis of the energy-related waste and effluent samples for all metals except mercury was performed by spark source mass spectrometry. These analyses were performed by Commercial Testing and Engineering, Golden, Colorado. This portion of the research effort was directed by Dr. Leroy Jacob and Ms. Sandra Sweeney. Spark source mass spectrometry has many advantages for element surveys at trace and ultratrace levels. Typical detection limits for the majority of elements are in the 50-100 ppb range. Use of the SSMS technique allows simultaneous determination of approximately 80 elements in most solid and liquid samples with a minimum of matrix effects, spectral overlap, or interelement interferences. Solid and liquid samples need not be subjected to ashing or chemical digestion prior to analysis. The high voltage radio frequency spark source ionizes all elements with approximately equal sensitivity. Also, the high energy source produces a leveling effect which tends to give a constant element sensitivity from one matrix to another. The relative intensity of a spectral line is related directly to the concentration of that element in the matrix. The relative intensity has been proven to be linear in relation to concentration over several orders of magnitude.

Sample Preparation--

Solid samples were prepared by mixing a 0.1 g sample with 0.1 g of ultrapure graphite in an agate mortar, adding the internal element standard, along with a few drops of redistilled alcohol, and evaporating the alcohol and water from the mix with an infrared lamp. The temperature at this point was 180°C and depending on compound form, may have caused loss of more volatile elements from the resulting SSMS sample pins.

Liquid samples were prepared by mixing a 20 ml aliquot of sample with 0.2 g of ultrapure graphite in an agate mortar, adding the internal element standard, along with a few drops of redistilled alcohol, and evaporating the alcohol and water from the mix with an infrared lamp. The resulting mix was compacted into polyethylene slugs, then inserted into a metal die. Hydraulic pressure was applied to the die and slug, forming a graphite electrode which is mounted in the spark source for analysis.

If excessive amounts of organic compounds were contained in either the solid or the liquid, the sample was thermally ashed in quartz at 350°C with the appropriate amount of graphite and the internal element standard. This ashing process eliminated interfering hydrocarbons for easier analysis and data interpretation.

Spark Source Analysis--

Elemental detection limits of approximately 0.1 to 0.5 ppm could be met and exceeded in most cases for purposes of an elemental survey on solid samples. In general, for a solid sample, calculated detection limits for each element have been presupposed on several points:

1. A 0.1 g sample.

2. 0.2 g of ultrapure graphite used for spark source electrodes.

3. Internal standards added at 10 μg/g per sample.

4. A total of 210 nanocoulombs (nC) taken from each set of electrodes, in the following manner of decreasing exposures on the plate: 100, 60, 30, 10, 6, 3, 1, 0.06, 0.01, 0.006 and 0.001 nC. This series of exposures should cover the ppb concentration range for most trace elements.

Elemental detection limits of approximately 1 to 2 ppb can be met and exceeded in most cases for purposes of elemental survey on a liquid sample. For a liquid sample, calculated detection limits for each element have been presupposed on the following points:

1. A 25 ml sample.

2. 0.1 g of graphite used for spark source electrodes.

3. Internal standard added at 10 μg/ml per sample.

4. A total of 210 nC taken from each set of electrodes, in the following manner of decreasing exposures on the plate: 100, 60, 30, 10, 6, 3, 1, 0.06, 0.01, 0.006, and 0.001 nC. This series of exposure would cover the ppm concentration range for most trace elements.

In the individual element discussion which follows, calculations were based on relative sensitivity factors (RSF) determined from a routine analytical elemental spike of indium, and calculations were based upon the "just disappearing line" technique, as outlined below.

Barium has seven naturally occurring isotopes at m/z 130, 132, 134, 135, 136, 137, and 138. The relative isotopic abundances are 0.108, 0.119, 2.44, 6.58, 7.87, 11.41, and 71.50 percent, respectively. Detection limits for barium were calculated from the sample preparation parameters as follows:

$$sp = \frac{\text{concentration of standard x just detectable exposure}}{\text{longest exposure}}$$

where

sp = photographic plate sensitivity, i.e., the relative concentration in ppm weight of any isotope which was "just detectable" on the longest exposure.

When indium was used at a concentration of 10 μg per 0.1 g of solid sample, the indium 115 isotope "just disappeared" on the 0.1 nC line; therefore, it was assumed

0.1 g solid sample

10 μg indium internal standard

indium 115 isotope 95.67 percent natural abundance

indium 113 isotope 4.24 percent natural abundance

$$\text{sp} = \frac{0.1\ \text{nC}}{100\ \text{nC}} \times \frac{10\ \mu\text{g}}{0.1\ \text{g}} \times 0.9567$$

$$\text{sp} = 9.6 \times 10^{-2}$$

Concentration of the impurity element was calculated.

$$\text{Concentration} = \text{sp} \times \frac{\text{longest exposure}}{\text{mass of standard isotope}} \times \frac{\text{mass element}}{\text{just detectable exposure}} \times \text{isotopic factor} \times \text{relative sensitivity factor}$$

For barium, a detection limit could be calculated if the m/z 138 isotope of barium "just disappeared" on the 100 nC exposure. Calculations were as follows:

$$\text{Concentration of barium} = 9.9 \times 10^{-2} \times \frac{100}{115} \times \frac{138}{100} \times 1.4 \times 1\ \text{RSF}$$

$$= 1.6 \times 10^{-1}\ \mu\text{g/g}$$

$$= 0.16\ \mu\text{g/g}$$

Detection limit for barium = 0.16 ppm

Photoplate interpretation was carried out using the just disappearing line method. Photoplate detection has several advantages over electrical detection. For example, it allowed simultaneous detection of all ion spectra thereby reducing effects of sample inhomogeneity. Also, spectra could be recorded at the highest available resolving power of the instrument, and reproducibility of the plate response was as good as ± 3 to ± 5 percent. The use of the photoplate allowed the recording of spectra without prior knowledge of the sample; i.e., in some cases unexpected interferences in the spectra led to erroneous results using electrical detection methods. Finally, a permanent record of produced spectra could be maintained for later evaluation.

However, there are disadvantages to the use of a photoplate, which must be recognized. The photoplate is nonlinear and has a lower analytical speed initially. Lower absolute sensitivity, halo, and background effects can also be significant. Photoplates can give a different response to high and low m/z ions. However, this difference in response is normally taken into account by the use of relative sensitivity factors for elemental determinations.

Precision and Accuracy--

Accuracy is related to the ability to determine elemental values precisely, both in a standard and in a given sample. The degree of certainty of the analysis can then be related to precision and thus to accuracy. Isotope dilution spark source mass spectrometry can be as good as 3 percent but ranges from 3 to 10 percent at 95 percent confidence limits. However, obtaining these precision levels calls for carefully controlled conditions. Overall sample-to-sample precision of the densitometer method should be between 3 and 20 percent using a photoplate recording device.

Mercury Analysis

Water, fly ash, and tar samples obtained from the energy-related activities being investigated in this program were analyzed for mercury by the cold vapor flameless atomic absorption (AA) technique (3). The flameless AA procedure is a physical method based on the absorption of energy at 254 nm by mercury vapor. The mercury in the sample is reduced to elemental mercury and is purged from the solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration. A schematic of the apparatus used to determine mercury by the flameless AA procedure is shown in Figure 7.

In addition to inorganic forms of mercury, organomercurials may be present in these samples. These organometallic compounds will not respond to the flameless atomic absorption technique unless they are first broken down and converted to mercuric ions. Potassium permanganate oxidizes many of these compounds; however, some organomercurials such as phenyl mercuric acetate and methyl mercuric chloride are known to require stronger conditions such as potassium persulfate for complete oxidation. Therefore, a persulfate oxidation step following the addition of permanganate was used to ensure that any organomercury compounds in the sample were oxidized to the mercuric ion before measurement. A heating step was required for the oxidative decomposition of methyl mercury chloride. The sensitivity of this method varies slightly depending on the sample matrix. In general, however, a detection limit of 2 ppb was achieved for the analysis of 100 ml or 100 g of sample.

Sample Preparation--

Sulfuric acid, nitric acid, and potassium permanganate were added to an appropriate aliquot of a liquid sample in a flask with a ground glass stopper. After a brief wait to permit oxidation of the sample, potassium persulfate was added and the stoppered sample heated to 95°C for 2 hr. The sample was cooled and hydroxylamine sulfate solution added to reduce excess permanganate. Stannous sulfate was added to the samples, and the flask was immediately attached to the aeration system. The mercury vapor was purged from the sample and passed into the absorption cell. The absorbance, which reached a peak within 30 sec, was recorded on a strip chart recorder. A standard curve was constructed by plotting peak height versus micrograms of mercury for a series of digested standards.

The digestion procedure for fly ash was similar to that for water. A 0.2 g portion of fly ash, aqua regia, and potassium permanganate were placed in a flask with a ground glass stopper and heated to 95°C for 30 min. The sample was allowed to cool, and hydroxylamine sulfate was added to reduce excess permanganate. Aliquots of water and stannous sulfate were added, and the flask was immediately attached to the aeration system as for water samples. Standards were treated in the same manner as samples.

Determination of mercury in oil required the decomposition of organic materials to obtain mercuric ions in aqueous solution. The method is time consuming but gives satisfactory results. Five gram quantities of sample, nitric acid, and sulfuric acid were refluxed for 1 hr in a closed system. The outlet of the distillate receiver was closed and the volatile compounds were collected. After the sample had fumed for 5 min, nitric acid was added through the addition funnel and distillation was continued until fumes of sulfuric acid are generated. The distillate was returned to the flask, refluxed for 15 min, and distilled a second time. The distillate was diluted and extracted with hexane to remove water-insoluble, undigested organic matter. Hydroxylamine sulfate and stannous sulfate were added to the aqueous sample, and the flask was immediately attached to the aeration system.

Analysis--

Once the stannous sulfate had been added to the sample to reduce the mercuric ion to elemental mercury, the sample flask was attached immediately to the aeration apparatus. The mercury vapor was purged from the sample and into the absorption cell. The absorbance, which reached a maximum within approximately 30 sec of the addition of the reducing agent, was recorded in a strip chart recorder. A standard curve was constructed by plotting peak height versus amount of mercury for a series of digested aqueous standards. Quality control standards, spiked samples, field blanks, method blanks, and duplicates were digested and analyzed with each set of samples to monitor the precision, accuracy, and recovery of the method.

Precision and Accuracy--

In a joint EPA/ASTM interlaboratory study of the cold vapor technique for total mercury in water, increments of organic and inorganic mercury were added to natural waters (34). Recoveries were determined by difference. A statistical summary of this study is presented in Table 3.

ORGANIC ANALYSIS

Procedures for identification of the organic components in the energy-related wastes and effluents are composed of several operations including sample preparation, data acquisition, qualitative analysis, and quantification of identified compounds.

Sample Preparation

The organic components in the effluents were separated into three fractions for analysis by the sample preparation procedures.

Volatile Organic Compounds--

Volatile organics, which are defined as compounds less than 2 percent soluble in water with boiling points less than 150°C, were isolated from the aqueous sample matrix by using a modification of the Bellar-Lichtenberg purge-and-trap technique (4). Liquid samples collected for volatile organic analysis (VOA) were removed from refrigeration and brought to room temperature immediately prior to analysis. A known volume of each sample was delivered to the glass sparging device by introducing pressure into the sample container with a flow of ultra high purity (UHP) nitrogen and allowing the contents to flow through a stainless steel tube connecting the container and the sparging device. The sparging device is pictured in Figure 8. Following the injection of an internal standard, the sample volume was sparged and the purged organics were collected on a Tenax GC trap connected to the sparging device. Following collection of the organics, the trap was removed from the purging device, connected to the GC/MS instrument, and backflushed with helium to desorb the organics onto the head of the cryogenically cooled chromatographic column. Experimental conditions for the volatile organic anaysis are presented in Table 4.

Oil and tar samples were prepared for volatile organic analysis by placing a known amount of the sample in the glass sparging device which already contained a known volume of distilled, deionized water. A surfactant was then added to insure dispersal of the oil or tar sample in the aqueous matrix. This mixture was sparged by the same procedures as described above, and the organic compounds collected on the trap were desorbed in a similar manner.

For solid effluent samples such as fly ash or gasifier wastes, the empty trap was packed with a known weight of the sample material and connected to the GC/MS instrument. Organic compounds were desorbed by heating the trap and back flushing with helium. These materials were collected on the head of a cryogenically cooled chromatographic column.

Semivolatile Organic Compounds--

Semivolatile organic compounds were also identified in the energy-related effluents. Semivolatiles are those compounds which can be isolated from the sample matrix by solvent extraction and which are amenable to analysis by gas chromatography.

Samples to be analyzed for semivolatile organic compound were extracted at acidic and at basic pH. The extraction scheme is presented in Figure 9. One liter of sample was adjusted to pH 12 or greater with 6N sodium hydroxide and serially extracted with 250, 100, and 100 ml portions of nanograde methylene chloride. The extracts were pooled, dried with anhydrous sodium sulfate, and concentrated to a volume of 1 ml using Kuderna-Danish evaporation techniques. The pH of the base/neutral extracted sample was adjusted to 2 with 6N hydrochloric acid and serially extracted with 200, 100, and 100 ml portions of methylene chloride. The extracts were pooled, dried, and concentrated. The use of this extraction scheme resulted in the preparation of a base/neutral and an acid extract for each sample.

Data Acquisition

One of three GC/MS units was used for the acquisition of data for the identification of organic components in the energy effluent samples. For volatile analysis a Hewlett-Packard Model 5982A GC/MS interfaced with a Systems Industries System 150 data system was used. Analysis of the sample extracts for semivolatile organic compounds was performed either on a Hewlett-Packard 5985A or on a Hewlett-Packard 5993A GC/MS unit. All volatile organic analyses were carried out by using packed chromatographic columns. Chromatographic and mass spectral conditions for separation and analysis of volatile compounds are presented in Table 4, and Figure 10 shows the chromatogram of a volatile component standard analyzed under these conditions. Initially, the analysis of semivolatile organic compounds was also performed on packed column. The conditions used in these analyses are listed in Table 5 and the total-ion current (TIC) chromatograms of an acid standard and a base-neutral standard analyzed under these conditions are shown in Figures 11 and 12. After it became apparent that some of the samples were very complex, capillary columns were used. The conditions used in the analysis of these samples on capillary column are presented in Table 6 and the corresponding TIC chromatograms for acid and base/neutral standard in Figure 13 and 14. For some samples, acceptable chromatography could not be obtained even with capillary columns. To improve the quality of the data generated by these analyses, a derivatizing technique employing N-methyl-N-trimethylsilyltrifluoroacetamide (MSTFA) was used. This reagent replaces the labile hydrogen in polar compounds such as phenols, alcohols, and carboxylic acids with a trimethylsilyl group. This procedure was employed in the analysis of both the acid and the base/neutral fractions. Derivatizing conditions are presented in Table 7; other analytical conditions remained the same. Examples of a derivatized acid and base/neutral standard are presented in Figure 15 and 16.

Qualitative/Quantitative Analysis

Organic components in the energy-related effluents were identified by manual and computer-assisted matching of molecular fragmentation patterns of observed pollutants with those of standard compounds. The appearance of identical ion fragments with proper intensity ratios at the same retention times in both sample and standards was accepted as sufficient to support identification. Computer software comprising a 32,000 spectra library and several standard references (36-38) were used when necessary to identify compounds. Standards of sample compounds identified in this manner were acquired when possible, and the retention times and molecular fragmentation patterns were obtained to allow positive identification. For some of the components in these samples, standards were not available, and the identification of these compounds is tentative.

Compounds in the volatile fraction of these samples were quantified by comparing the area of the extracted-ion current profile (EICP) of the sample peak with standard peak areas of a known concentration. The calculations were carried out using the following equation:

$$C_{sample} = \frac{A_{sample} \times C_{standard}}{A_{standard}}$$

where

C_{sample} = concentration of compound in sample (μg/ml)

A_{sample} = area of EICP peak of compound in sample

$C_{standard}$ = concentration of compound in external standard

$A_{standard}$ = area of EICP peak of compound in external standard

A laboratory blank containing 25 ml prepurged distilled water with either 1,2-dibromoethane or chloroethylbenzene as an internal standard was analyzed daily to indicate the presence of any contamination due to sample preparation procedures. The areas of all peaks which were attributable to a blank were subtracted from the appropriate peaks in the sample chromatogram.

Organic compounds in the semivolatile fractions of the sample were quantified by comparison of the EICP areas of the sample peaks with that of 40 ng of D-10 anthracene, the internal standard coinjected with each sample. Use of this quantification technique requires determination of the relative response ratio (RRR) of each compound of interest vs. D-10 anthracene. This value was determined from triplicate analysis of the standard compound coinjected with the internal standard using the equation:

$$RRR = \frac{A_{cmpd} \times C_{int\ std}}{A_{int\ std} \times C_{cmpd}}$$

where

A_{cmpd} = area of the EICP peak of the compound of interest in the standard mixture.

C_{cmpd} = concentration of compound of interest in standard mixture.

$A_{int\ std}$ = area of the EICP peak of the internal standard.

$C_{int\ std}$ = concentration of the internal standard.

The concentration of the compound of interest in the sample is calculated as follows:

$$C_{sample} = \frac{A_{sample} \times C_{int\ std}}{A_{int\ std} \times RRR}$$

where

C_{sample} = concentration of compound of interest in the sample.

A_{sample} = area of the EICP peak of compound of interest.

$C_{int\ std}$ = concentration of internal standard in sample.

$A_{int\ std}$ = area of the EICP peak of internal standard in the sample.

RRR = relative response ratio determined above.

A laboratory blank consisting of 1 liter of distilled water was extracted with each set of samples and analyzed with the sample. Contaminants due to sample preparation procedures were identified and quantified, and these materials were subtracted from the samples.

Tables 8, 9, and 10 list the standards which were obtained and analyzed under this program for the identification of the volatile, acid-extractable, and base/neutral extractable components in the energy-related wastes. Quantification of compounds for which standards were not available was based on the relative response ratio of structurally similar materials.

SECTION 5

RESULTS AND DISCUSSION

INTRODUCTION

All results of analyses performed to identify components in the energy-related wastes and effluents are presented in Appendices A through G. Each appendix contains 1) a list of the samples associated with a particular energy-related activity which were analyzed under this program, 2) the results of the mercury analyses of the samples, 3) the results of the SSMS analyses for metals in these samples, 4) a list of the organic compounds identified and quantified in the volatile fraction of each sample, and 5) a list of the organic compounds identified and quantified in the acid and in the base/neutral fractions of each sample. Notes to explain the table of compound identification and quantification of the volatile, acid, and base/neutral fractions of each sample are provided below.

1. Approximate (∿) values are assigned to those compounds whose quantifications are based in the relative response ratios of structurally similar compounds.
2. TMS appearing before the identification of a compound signifies that this compound did undergo derivatization by MSTFA. Those compounds not so labeled were not affected by the derivatizing reagent.
3. For coeluting peaks in the acid or base/neutral sample fraction, the combined peak area of the two compounds was determined, and quantification was based on the relative response ratio of one of the compounds. An approximate quantitative value is given for the combination of the two compounds.
4. Peaks appearing in the TMS blank and reappearing in subsequent samples have been termed "TMS derivatization artifacts." A TMS blank was obtained by derivatizing methylene chloride with MSTFA at the sample:reagent volume ratio and under the same conditions as those utilized in the sample analyses.

Table 11 presents an overview of the organic compounds identified in the effluents of each energy-related activity surveyed in this program.

COAL STRIP MINING

The mercury levels in the aqueous effluent obtained from coal mining operations were, in general, fairly low. Of the 20 mines whose wastes were sampled and analyzed, only one was shown to contain mercury at a level higher than 10 ppb. This mine, operated by Eastern Association Coal Company, is located in West Virginia. The effluents of other mines located in this area contained smaller amounts of this metal. Other metals that were determined to be present in these samples at moderate (≤1 ppm) or high (>1 ppm) concentrations include the alkali and alkali earth metals. In some samples, calcium and magnesium concentrations exceeded 10 ppm. Also present in most of these samples were significant levels of strontium, sulfur, silicon, chlorine, and fluorine. However, the concentrations of toxic metals (e.g., lead, arsenic, selenium, and cadmium) in general were less than 10 ppb.

The most significant component of the volatile fraction of the coal mining effluents was methylene chloride. In most samples, this compound was determined to be present at levels in the parts-per-million range. The identification of other halogenated volatile materials such as chloroform, 1,1,1-trichloroethane, and 1,1,2,2-tetrachloroethane suggests either that these effluents had been chlorinated as a treatment prior to discharge or that a chlorinating agent is used in some phase of the coal mining process. The compounds most frequently detected in the acid and base/neutral fractions of these samples were phthalates. Analysis of blanks with each set of samples also indicated the presence of such materials as methylene chloride and phthalates; however, the concentrations of these compounds determined in the samples were significantly higher.

OIL REFINERIES

In general, concentrations of mercury and other elements determined in the oil refinery effluents were low. Those elements which did constitute major components (>1 ppm) in these samples include calcium, chlorine, fluorine, magnesium, phosphorus, potassium, strontium, and sulfur. However, none of these materials was determined to be present at levels which constitute an environmental hazard.

Organic compounds identified in the volatile fractions of these effluent samples were determined to be present at relatively low levels. Among the few volatile components of the samples were trihalomethanes, cyclohexane, benzene, and toluene. Several sulfur-containing compounds were tentatively identified. However, standards were not available to confirm these identifications. The major semivolatile organic components identified in these effluents include phenols and normal alkanes. With the exception of phenol and p-cresol in one sample, all extractable organic compounds were determined to be present at levels less than 100 ppb.

OIL SHALE OPERATIONS

Mercury levels determined in effluents from the Paraho oil shale retorting process were less than 1 ppb, with the exception of one sample of process water which was less than 5 ppb. Other elements detected in these samples at moderate to high levels include sodium, potassium, calcium, magnesium, iron, sulfur, and strontium. It is of interest that the three samples of this set which are most representative of the process discharge contain arsenic at concentrations approaching or exceeding 1 ppm. The levels of the other toxic metals, however, are fairly low.

Organic compounds identified in the volatile fractions of these samples include significant levels of halogenated compounds including methylene chloride, chloroform, carbon tetrachloride, bromodichloromethane, dibromochloromethane, and trichloroethane. The presence of these compounds may be due to the use of chlorination as a treatment method for the wastes or to the use of water which has already been chlorinated in the retorting process. The product water samples (TK500 and TK522) contained thiophene, alkyl substituted thiophenes, benzene, and alkyl substituted benzenes. The recycled gas condensate sample contained a number of compounds at levels greater than 1 ppm including nitriles, thiophene and alkyl substituted thiophenes, benzene and substituted benzenes, ketones and substituted pyridines. The semivolatile fractions of these samples were found to contain carboxylic acids and alkyl substituted pyridines in the acid and base/neutral extracts, respectively. Components in the samples of product water also include the homologous series of normal alkanes from n-undecane (C_{11}) to pentacosane (C_{25}) at levels in the parts-per-million range.

In the samples collected during the operation of the oil shale retort of Lawrence Livermore Laboratory, the mercury levels increased with time into experiment (TIE). The concentration of this metal determined in the earlier samples is approximately 1 ppb. As the retorting process proceeds, the amount of mercury in the effluent increases until, in the final sample collected, it has reached 58 ppb. Although the concentration of the other elements in these samples, as determined by SSMS, is somewhat higher than in the effluents of other energy-related activities, there is no obvious trend of concentration increasing with TIE.

The results of the analysis of these samples for organics indicates that they are heavily contaminated with volatile compounds. Among the purgeable organic components identified in these samples are normal alkanes, thiophene and alkyl substituted thiophenes, benzene and alkyl substituted benzene, ketones, substituted pyridines, substituted pyrroles, and, possibly, substituted cycloalkanes. In general, levels of these components increased as retorting proceeded. These effluents also contained a wide variety of semivolatile or extractable organic compounds including substituted phenols, a homologous series of alkanoic acids, substituted pyridines, an alkane series up to dotriacontane (C_{32}), an alkene series up to heptacosene (C_{27}), and a variety of ketones. Again, the number of components in these effluents and their concentrations increased with retort progress.

It is probable that the increase in all types of contaminants in these samples as a retorting experiment progresses is in part due to leaching of contaminants from spent shale and subsequent transport of these materials down the retort. In assessing data generated by analyses of these effluent samples, it must be noted that these wastes were sampled prior to any cleanup or pollution abatement treatment. This collection scheme is in contrast to many other samples analyzed under this program which were final effluents collected after treatment.

COAL-FIRED POWER PLANTS

The levels of mercury determined in the aqueous effluents from coal-fired power plants obtained through EGD were generally low. There is no apparent difference in the mercury concentration in these samples from one geographical area to another. In these samples the alkali and alkali earth metals were shown to be present at concentrations exceeding 1 ppm. Strontium and sulfur were also found at significant levels in many of these samples.

The volatile fractions of many of these aqueous waste samples contained very high levels of methylene chloride. Other volatile components identified in the coal-fired power plant effluents include chloroform, benzene, toluene, trichloroethylene, and bromoform. Organic compounds identified in the extractable fractions of these samples include primarily phthalates and alkanes.

The concentrations of mercury determined in the fly ash and scrubber sludge samples obtained from coal-fired power plants were also determined to be relatively low. Other elements, however, were determined to be present in these samples at very high levels. Antimony, arsenic, cadmium, lead, copper, manganese, and sulfur were among the elements determined to present in these samples at levels exceeding 10 ppm in all cases and greater than 100 ppm in several of the samples.

A wide variety of organic compounds were thermally desorbed from the solid waste samples. These compounds include a number of ketones, alcohols, and ethers. However, only phthalates were determined to be present in the semivolatile fractions at significant levels, probably because these samples were collected from the final discharge of a treatment process.

COAL LIQUEFACTION

The volatile fractions of the effluents obtained from the coal liquefaction operation contained a number of organic compounds at relatively high concentrations. Among the compounds identified in these samples were alkyl benzenes, a variety of unsaturated hydrocarbons, and low-molecular-weight chlorinated materials including methylene chloride, chloroform, and trichloroethylene. Many of these materials were determined to be present at levels exceeding 100 ppb; some at concentrations greater than 1000 ppb.

These samples were also found to be highly contaminated with extractable organic compounds. The major components of the semivolatile fraction of these samples were alkyl phenols. Alkyl phenols from phenol through isomers of C_8 alkyl phenol were determined to be present at concentrations exceeding 1000 ppb. Several higher-molecular-weight normal alkanes were also present in these samples.

COAL GASIFICATION

The gasifier solid samples obtained from Pittsburgh Energy Technology Center were found to contain only low levels of mercury. However, other elements including cerium, chromium, copper, and zirconium were determined to be present at concentrations exceeding 100 ppm. Major organic components identified in these samples include methylene chloride, chloroform, isopropyl alcohol, carbon tetrachloride, ethyl acetate, and several low-molecular-weight alkanes.

The concentrations of mercury in the samples obtained from the underground coal gasification process operated by the Laramie Energy Technology Center were also quite low. Elements which were determined to be present in significant concentrations in these samples include calcium, iron, magnesium, phosphorus, potassium, sulfur, and, in some cases, strontium.

In the samples obtained from wells in the Hanna III site prior to gasification, the number of organic components and the concentrations of these compounds are relatively low. The compounds identified in the volatile fractions of these samples include methylene chloride, dichloroethylene, and traces of benzene and toluene. Extractable compounds identified in these samples include low levels of phthalates and normal hydrocarbons. Samples obtained from the same wells during the gasification contained more volatile organic components than did the pre-burn samples. Volatile components were tentatively identified as thiols, ethers, and substituted amines. Organic compounds identified in extractable fractions were primarily phthalates and normal hydrocarbons. There was not a significant difference in the concentration of organic components identified in the pre-burn and during-burn samples collected from Wells 9 and 14, perhaps because the wells are some distance from the burn area. Therefore, the groundwater movement may not have transported the leached materials to these wells by the time the sampling was conducted. Samples of the product water obtained from the Hanna III test during gasification contained a large number of organic compounds in very high concentrations. Among the components identified in the volatile fractions of these compounds were nitriles, ketones, thiophenes, pyridines, and alkyl benzenes. Extractable organic components identified in these samples include a variety of alkyl phenols, alkyl naphthalenes, and normal alkanes at concentrations exceeding 10 ppm.

In the samples obtained from wells in the Hanna III site some time after the gasification operation had been completed, both the number and concentration of organic components were significantly lower. In the volatile fractions of many of these samples, only traces of benzene, carbon disulfide, and toluene were determined. In the extractable fractions of these samples, alkyl phenols, carboxylic acids, and normal alkanes were identified. However, all of these compounds were determined to be present at relatively low concentrations.

Mercury levels determined in the product tar and product liquor samples obtained from the lignite gasification operation of Grand Forks Energy Research were less than 1 ppm. High concentrations of a number of other elements were determined in these samples, particularly in the product tar. Very high levels of a number of organic compounds were detected in these samples. Among the organic components identified were alkylphenols, carboxylic acids, normal alkanes, and phthalates. The product tar was the more heavily contaminated of the two samples and also contained a number of alkenes and polynuclear aromatics.

In the aqueous samples obtained from wells in the Hoe Creek II experimental site prior to gasification, the number of components identified and the concentrations at which they were determined were quite low. After the experimental burn was conducted, the number and amount of material found in these samples increased significantly. Immediately after the gasification experiment, samples obtained from wells closest to the burn zone showed the greatest increase in types and levels of contaminant. As time passed, wells further from the burn zone began to show the effect of leaching of the residual reaction products by the natural movement of groundwater. Prior to gasification, calcium and magnesium were the only elements found in these samples at concentrations exceeding 10 ppm. After gasification, iron, potassium, sulfur, titanium, and strontium were also determined to be major components of these effluents. Only alkanes and phthalates were determined in the samples collected before the test burn. The presence of these compounds might be due to the drilling oil and PVC pipes used in constructing the wells and collecting the samples. However, after gasification, the classes of compounds identified in these samples included alkanes, alkenes, alkyl phenols, alkyl benzenes, alkyl thiophenes, alkyl anilines, alkyl pyridines, and polynuclear aromatics.

GEOTHERMAL ENERGY PRODUCTION

Because the samples obtained from geothermal energy-production activities were collected as part of a round-robin analytical effort, additional data are available on the characterization of these samples. This information is presented with the results of the other analyses performed on these samples. The levels of mercury and most other elements determined in these samples were relatively low. Elements found to be present at concentrations exceeding 1 ppm include arsenic, barium, calcium, cesium, chlorene, fluorine, iron lead, lithium, magnesium, manganese, molybdenum, phosphorus, potassium, rubidium, silicon, sodium, strontium, sulfur, titanium, and zinc.

Few organic compounds were identified in either the volatile or the extractable fractions of these samples. Low levels of methylene chloride, chloroform, benzene, and toluene were determined in the volatile fractions. Small amounts of phenol were found in the extractable portion of the effluents from the geothermal energy production activity.

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TABLE 1. DESCRIPTION OF EFFLUENT SAMPLES RECEIVED AND CHARACTERIZED FOR ORGANIC AND INORGANIC COMPONENTS

Energy-related activity	Organization	Site	Sample description	Sample code
Coal strip mining	Versar/EGD	W. MT	Water sample from Peter Kiewitt and Sons Decker No. 1 Mine	NC 104 VOA NC 107 A, B/N NC 101 A, B/N, BLK NC 1-12 Metals
Coal strip mining	Versar/EGD	MO	Water sample from Peabody Ben Veer Mine	NC 503 VOA NC 507 A, B/N NC 502 A, B/N, BLK NC 512 Metals
Coal strip mining	Versar/EGD	MO	Water sample from Peabody Ben Veer Mine	NC 516 VOA NC 518 A, B/N NC 523 Metals
Coal strip mining	Versar/EGD	MO	Water sample from Peabody Ben Veer Mine	NC 526 VOA NC 529 A, B/N NC 534 Metals
Coal strip mining	Versar/EGD	OH	Water sample from Peabody Sunnyhill Mine	T 513 VOA T 511 VOA, BLK T 531 A, B/N T 510 A, B/N, BLK T 560 Metals
Coal strip mining	Versar/EGD	TX	Water sample from Texas Power and Light Fairfield Mine	V 601 VOA V 625 VOA, BLK V 605 A, B/N V 624 A, B/N, BLK V 609 Metals
Coal strip mining	Versar/EGD	TX	Water sample from Texas Power and Light Fairfield Mine	V 613 VOA V 616 A, B/N V 620 Metals
Coal strip mining	Versar/EGD	IL	Water sample from Arch Mineral Captain Mine	NC 715 VOA NC 719 A, B/N NC 702 A, B/N, BLK NC 723 Metals
Coal strip mining	Versar/EGD	IL	Water sample from Arch Mineral Captain Mine	NC 726 VOA NC 730 A, B/N NC 734 Metals
Coal strip mining	Versar/EGD	PN	Water sample from Bettrami Enterprises Honeybrook Mine	V 705 VOA V 720 A, B/N V 702 A, B/N, BLK V 744 Metals

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal strip mining	Versar/EGD	IN	Water sample from Amax Coal Company Ayshire Mine	NC 804 VOA NC 808 A, B/N NC 802 A, B/N, BLK NC 812 Metals
Coal strip mining	Versar/EGD	IN	Water sample from Amax Coal Company Ayshire Mine	NC 816 VOA NC 819 A, B/N NC 823 Metals
Coal strip mining	Versar/EGD	IN	Water sample from Amax Coal Company Ayshire Mine	NC 826 VOA NC 830 A, B/N NC 834 Metals
Coal strip mining	Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 914 VOA NC 929 A, B/N NC 909 A, B/N, BLK NC 955 Metals
Coal strip mining	Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 917 VOA NC 931 A, B/N NC 958 Metals
Coal strip mining	Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 920 VOA NC 935 A, B/N NC 964 Metals
Coal strip mining	Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 971 VOA NC 974 A, B/N NC 967 A, B/N, BLK NC 969 Metals NC 979 Metals
Coal strip mining	Versar/EGD	KY	Water sample from Island Creek Coal Company Hamilton No. 1 Mine	NC 1004 VOA NC 1013 A, B/N NC 1001 A, B/N, BLK NC 1028 Metals
Coal strip mining	Versar/EGD	WV	Water sample from Valley Camp Coal Company	PN 1105 VOA PN 1111 A, B/N PN 1101 A, B/N, BLK PN 1119 Metals
Coal strip mining	Versar/EGD	WV	Water sample from Valley Camp Coal Company	PN 1126 VOA PN 1130 A, B/N PN 1134 Metals

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal strip mining	Versar/EGD	W. KY	Water sample from Falcon Haddix Mine	NC 125-1 VOA NC 1213 A, B/N NC 1201 A, B/N, BLK NC 1228 Metals
Coal strip mining	Versar/EGD	W. KY	Water sample from Falcon Haddix Mine	NC 125-2 VOA NC 1215 A, B/N NC 1229 Metals
Coal strip mining	Versar/EGD	W. KY	Water sample from Falcon Haddix Mine	NC 126-1 VOA NC 126-2 VOA NC 1203 VOA, BLK
Coal strip mining	Versar/EGD	WV	Water sample from Eastern Association Coal Company Joanne Mine	NC 1437 VOA NC 1440 A, B/N NC 1402 A, B/N, BLK NC 1433 A, B/N, BLK NC 1434 Metals NC 1444 Metals
Coal strip mining	Versar/EGD	WV	Water sample from Bethlehem Boone 131 Mine	NC 1508 VOA NC 1547 A, B/N NC 1501 A, B/N, BLK NC 1503 Metals
Coal strip mining	Versar/EGD	WV	Water sample from Bethlehem Boone 131 Mine	NC 1509 VOA NC 1544 VOA NC 1505 A, B/N, BLK NC 1530 Metals NC 1551 Metals
Coal strip mining	Versar/EGD	VA	Water sample from Island Creek Coal Company Mine Pocahontas No. 3	NC 1626 VOA NC 1603 VOA, BLK NC 1630 A, B/N NC 1602 A, B/N, BLK NC 1634 Metals
Coal strip mining	Versar/EGD	TN	Water sample from Consolidated Coal Company Matthews No. 3 Mine	NC 1708 VOA NC 1712 A, B/N NC 1702 A, B/N, BLK NC 1716 Metals
Coal strip mining	Versar/EGD	TN	Water sample from Consolidated Coal Company Matthews No. 3 Mine	NC 1719 VOA NC 1723 A, B/N NC 1742 A, B/N, BLK NC 1727 Metals

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal strip mining	Versar/EGD	Shannopin	Water sample from Jones and Laughlin	NC 1802 VOA NC 1865 A, B/N NC 1824 A, B/N, BLK NC 1858 A, B/N, BLK NC 1827 Metals NC 1849 Metals
Coal strip mining	Versar/EGD	PA	Water sample from National Mines Isabella Mine	NC 1936 NC 1929 A, B/N NC 1902 A, B/N, BLK NC 1930 A, B/N, BLK NC 1921 Metals
Coal strip mining	Versar/EGD	PA	Water sample from Duquesne Light Company Warwick Mine	NC 2021 VOA NC 20218 A, B/N NC 2027 A, B/N, BLK NC 20216 A, B/N, BLK NC 2028 Metals NC 20214 Metals
Coal strip mining	Versar/EGD	PA	Water sample from North American Coal Company Conemaugh No. 1 Mine	NC 2117 VOA NC 21105 VOA, BLK NC 2129 A, B/N NC 2102 A, B/N, BLK NC 2114 A, B/N, BLK NC 2103 Metals
Coal strip mining	Versar/EGD	OH	Water sample from Central Ohio Coal Company Muskingum Mine	NC 2209 VOA NC 2207 VOA, BLK NC 2214 A, B/N NC 2202 A, B/N, BLK NC 2218 Metals
Coal strip mining	Versar/EGD	OH	Water sample from Central Ohio Coal Company Muskingum Mine	NC 2211 VOA NC 2230 A, B/N NC 2206 A, B/N, BLK NC 2238 Metals
Oil refineries	RETA/EGD	Texas City, TX	Water sample from Amoco Oil Company	181-9
Oil refineries	RETA/EGD	Commerce City, CO	Water sample from Asmera Oil Company	C-512
Oil refineries	RETA/EGD	Toledo, OH	Water sample from Sun Oil Company	I-515
Oil refineries	RETA/EGD	El Dorado, KS	Water sample from Getty Refining and Marketing Company	G-607
Oil refineries	RETA/EGD	Newell, WV	Water sample from Quaker State Oil Refining Corporation	Q-902

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Oil shale operations	Paraho Development Corporation/DEI	Anvil Points, CO	Mine dust control water	Mine dust control water
Oil shale operations	Paraho Development Corporation/DEI	Anvil Points, CO	Groundwater from Well No. 4	Well No. 4
Oil shale operations	Paraho Development Corporation/DEI	Anvil Points, CO	Water from industrial pond	Par Industrial Pond
Oil shale operations	Paraho Development Corporation/DEI	Anvil Points, CO	Recycled gas condensate	Recycled gas condensate
Oil shale operations	Paraho Development Corporation/DEI	Anvil Points, CO	Product water from Tank 522	Process water TK 522
Oil shale operations	Paraho Development Corporation/DEI	Anvil Points, CO	Product water from Tank 500	Process water TK 500
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 26.15 hr after initiation of retorting process on 11-7-78	LLL #1
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 30.40 hr after initiation of retorting process on 11-7-78	LLL #2
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 34 hr after initiation of retorting process on 11-7-78	LLL #3
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 37.25 hr after initiation of retorting process on 11-7-78	LLL #4
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 42 hr after initiation of retorting process on 11-8-78	LLL #5
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 47.90 hr after initiation of retorting process on 11-8-78	LLL #6
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 50.76 hr after initiation of retorting process on 11-8-78	LLL #7
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 54.33 hr after initiation of retorting process on 11-8-78	LLL #8
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 57.84 hr after initiation of retorting process on 11-8-78	LLL #9
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 61.43 hr after initiation of retorting process on 11-8-78	LLL #10

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 65.76 hr after initiation of retorting process on 11-9-78	LLL #11
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 70.00 hr after initiation of retorting process on 11-9-78	LLL #12
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 74.23 hr after initiation of retorting process on 11-9-78	LLL #13
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 74.23 hr after initiation of retorting process on 11-9-78	LLL #14
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 76.38 hr after initiation of retorting process on 11-9-78	LLL #15
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 76.38 hr after initiation of retorting process on 11-9-78	LLL #16
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 78.43 hr after initiation of retorting process on 11-9-78	LLL #17
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 78.43 hr after initiation of retorting process on 11-9-78	LLL #18
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 80.15 hr after initiation of retorting process on 11-9-78	LLL #19
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 82.45 hr after initiation of retorting process on 11-9-78	LLL #20
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 85.76 hr after initiation of retorting process on 11-9-78	LLL #21
Oil shale operations	DOE/LLL	Livermore, CA	Product water collected 88.75 hr after initiation of retorting process on 11-9-78	LLL #22
Oil shale operations	DOE/LLL	Livermore, CA	Sample of water used in retorting process on 11-7-78	LLL blank 11-7-78
Oil shale operations	DOE/LLL	Livermore, CA	Sample of water used in retorting process on 11-8-78	LLL blank 11-8-78
Coal-fired power plants	E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021701
Coal-fired power plants	E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021702

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal-fired power plants	E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021703
Coal-fired power plants	E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021712
Coal-fired power plants	E.H. Richardson/EGD	Beesely Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021713
Coal-fired power plants	E.H. Richardson/EGD	Vero Beach, FL	Water sample from Vero Beach Municipal Power Station	021705
Coal-fired power plants	E.H. Richardson/EGD	Vero Beach, FL	Water sample from Vero Beach Municipal Power Station	021706
Coal-fired power plants	E.H. Richardson/EGD	Vero Beach, FL	Water sample from Vero Beach Municipal Power Station	021708
Coal-fired power plants	E.H. Richardson/EGD	Newark, NJ	Water sample from Public Service Electric and Gas Company, Linden Generating Station	021711
Coal-fired power plants	E.H. Richardson/EGD	Marion, IL	Water sample from Southern Illinois Power Corporation, Marion Generating Station	021714
Coal-fired power plants	E.H. Richardson/EGD	Marion, IL	Water sample from Southern Illinois Power Corporation, Marion Generating Station	021715
Coal-fired power plants	E.H. Richardson/EGD	Marion, IL	Water sample from Southern Illinois Power Corporation, Marion Generating Station	021718
Coal-fired power plants	E.H. Richardson/EGD	Jacksonville, IL	Water sample from Western Illionis Power Corporation, Pearl Generating Station	021720
Coal-fired power plants	E.H. Richardson/EGD	Jacksonville, FL	Water sample from Western Illinois Power Corporation, Pearl Generating Station	021723
Coal-fired power plants	E.H. Richardson/EGD	Chicago, IL	Water sample from Commonwealth Edison, Crawford Generating Station	021725
Coal-fired power plants	E.H. Richardson/EGD	Fergus Falls, MN	Water sample from Otter Tail Power Company, Hoot Lake Power Station	021726
Coal-fired power plants	E.H. Richardson/EGD	Fergus Falls, MN	Water sample from Otter Tail Power Company, Hoot Lake Power Station	021727
Coal-fired power plants	E.H. Richardson/EGD	Rapid City, SD	Water sample from Black Hills Power and Light, Ben French Station	021731
Coal-fired power plants	E.H. Richardson/EGD	Canton, OH	Water sample from Ohio Power Company, Kammer Station	021732

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal-fired power plants	E.H. Richardson/EGD	Canton, Ohio	Water sample from Ohio Power Company, Kammer Station	021733
Coal-fired power plants	E.H. Richardson/EGD	Canton, Ohio	Water sample from Ohio Power Company, Kammer Station	021734
Coal-fired power plants	E.H. Richardson/EGD	Canton, Ohio	Water sample from Ohio Power Company, Kammer Station	021735
Coal-fired power plants	E.H. Richardson/EGD	Akron, Ohio	Water sample from Ohio Edison, R.E. Burger	021736
Coal-fired power plants	E.H. Richardson/EGD	Akron, Ohio	Water sample from Ohio Edison, Gorge Plant	021739
Coal-fired power plants	E.H. Richardson/EGD	Pensacola, FL	Water sample from Florida Power and Light Crist Station	021744
Coal-fired power plants	E.H. Richardson/EGD	Pensacola, FL	Water sample from Florida Power and Light Crist Station	021755
Coal-fired power plants	E.H. Richardson/EGD	Shippingport, PA	Water sample from Pennsylvania Power Company Bruce Mansfield	021745
Coal-fired power plants	E.H. Richardson/EGD	Houston, TX	Water sample from Houston Lighting and Bertran Station	021747
Coal-fired power plants	E.H. Richardson/EGD	Houston, TX	Water sample from Houston Lighting and Bertran Station	021748
Coal-fired power plants	E.H. Richardson/EGD	Bismark, ND	Water sample from Montana-Dakota Utilities Company, Lewis and Clark Station	021749
Coal-fired power plants	Rockwell International	Stanton, ND	Fly ash sample from Leland Olds Power Station	Leland Olds
Coal-fired power plants	Rockwell International	Center, ND	Fly ash sample from Milton R. Young Power Station	Milton R. Young
Coal-fired power plants	Rockwell International	Big Stone City, SD	Fly ash sample from Big Stone Station	Big Stone
Coal-fired power plants	Rockwell International	Fergus Falls, MN	Fly ash sample from Hoot Lake Station	Hoot Lake
Coal-fired power plants	Rockwell International	Stanton, ND	Fly ash sample from U.P.A. Station	U.P.A.
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	0120-1
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	10-3

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	8-2
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	1209-1
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	0124-1
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	17-1
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	0116-1
Coal-fired power plants	Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	1005-1
Coal-fired power plants	Rockwell International	Stanton, ND	Water sample from Leland Olds Power Station	Pond Water
Coal liquefaction	DOE	Ft. Lewis, WA	Final effluent from pilot plant	#9WWTPI
Coal liquefaction	DOE	Ft. Lewis, WA	Final effluent from pilot plant	#10WWTPI
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #3 on 8-5-77 preburn	080577-WS-3
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #6 on 8-5-77 preburn	080577-WS-6
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #8 on 8-5-77 preburn	080577-WS-8
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #9 on 8-5-77 preburn	080577-WS-9
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #1 on 10-4-77	100477-WS-1
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #2 on 10-4-77	100477-WS-2
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #3 on 10-4-77	100477-WS-3
Coal gasification	DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #5 on 10-4-77	100477-WS-5

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #7 on 10-4-77	100477-WS-7
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #9 on 10-4-77	100477-WS-9
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from production well B on 10-4-77	100477-B
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #2 on 12-2-77	120277-WS-2
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #4 on 12-2-77	120277-WS-4
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 12-2-77	120277-WS-5
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #2 on 1-6-78	010678-WS-2
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #3 on 1-5-78	010578-WS-3
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #4 on 1-4-78	010478-WS-4
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 1-4-78	010478-WS-5
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #6 on 1-4-79	010478-WS-6
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #7 on 1-4-78	010478-WS-7
Coal gasification	DOE/LLL	Hoe Creek II Gillette, NY	Unfiltered water collected from well #8 on 1-4-78	010478-WS-8
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #9 on 1-4-79	010478-WS-9
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well A on 1-16-78	011678-A
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well B on 1-16-78	011678-B

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well A on 2-14-78	021478-A
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well C on 2-14-78	021478-C
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #1 on 2-14-78	021478-WS-1
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #3 on 2-14-78	021478-WS-3
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #5 on 2-14-78	021478-WS-5
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #8 on 2-14-78	021478-WS-8
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well A on 4-10-78	041078-A
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well B on 4-11-78	041178-B
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #1 on 4-11-78	041178-WS-1
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #3 on 4-10-78	041078-WS-3
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #5 on 4-10-78	041078-WS-5
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #8 on 4-10-78	041078-WS-8
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well A on 6-13-78	061378-A
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #1 on 6-13-78	061378-WS-1
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #2 on 6-13-78	061378-WS-2
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 6-13-78	061378-WS-5

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #6 on 6-13-78	061378-WS-6
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #8 on 6-13-78	061378-WS-8
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #1 on 9-21-78	092178-WS-1
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #3 on 9-21-78	092178-WS-3
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 9-21-78	092178-WS-5
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #6 on 9-21-78	092178-WS-6
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #8 on 9-21-78	092178-WS-8
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #10 on 11-31-78	113178-WS-10
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #12 on 11-31-78	113178-WS-12
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Liquid condensate and tar collected on 10-30-77	LC 101077
Coal gasification	DOE/LLL	Hoe Creek II Gillette, WY	Liquid condensate and tar collected on 12-1-77	LC 011277
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-17-77 preburn	UCG-001
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-17-77 preburn	UCG-002
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-17-77 preburn	UCG-003
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-17-77 preburn	UCG-004
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-17-77 preburn	UCG-005

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-17-77 preburn	UCG-006
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-23-77	UCG-007
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-23-77	UCG-008
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-23-77	UCG-009
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-23-77	UCG-010
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-23-77	UCG-011
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-23-77	UCG-012
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Blank distilled water after setting in PVC samples on 5-23-77	UCG-013
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Blank distilled water after setting in PVC samples on 5-23-77	UCG-014
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Blank distilled water after setting in PVC samples on 5-23-77	UCG-015
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-13-77	UCG-016
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-13-77	UCG-017
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-13-77	UCG-018
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-19-77	UCG-019
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-19-77	UCG-020

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-19-77	UCG-021
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product tar condensed from production stream during gasification on 7-13-77	UCG-022
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Product tar condensed from production stream during gasification on 7-19-77	UCG-023
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #2 collected on 7-12-78	III-2-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #6 collected on 7-12-78	III-6-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #7 collected on 7-12-78	III-7-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #8 collected on 7-12-78	III-8-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected on 7-12-78	III-9-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #10 collected on 7-12-78	III-10-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #11 collected on 7-12-78	III-11-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #12 collected on 7-12-78	III-12-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #13 collected on 7-12-78	III-13-7
Coal gasification	DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected on 7-12-78	III-14-7
Coal gasification	DOE/GFETC	Grand Forks, ND	Product tar from slagging gasifier experiment RA-18 collected 5-9-77	Product tar RA-18
Coal gasification	DOE/GFETC	Grand Forks, ND	Aqueous product liquor from slagging gasifier experiment RA-18 collected 5-19-77	Aqueous Product Liquor RA-18
Coal gasification	DOE/PETC	Pittsburgh, PA	Bottom ash from an industrial fixed-bed, air-blown, atmospheric pressure gasifier collected 3-21-78	HG-2

(continued)

TABLE 1. (continued)

Energy-related activity	Organization	Site	Sample description	Sample code
Coal gasification	DOE/PETC	Pittsburgh, PA	Dust collected from producer gas in industrial fixed-bed, air-blown, atmospheric pressure gasifier collected 3-21-78	HG-9
Geothermal energy production	Battelle Northwest/ ERDA	Imperial Valley, CA	Water sample from East Mesa Geothermal Test Site collected July 1988	GRR-1
Geothermal energy production	Battelle/Northwest/ ERDA	Salton Sea, CA	Water sample from Woolsey Well #1 collected August 1977	GRR-2

TABLE 2. RESERVOIR CHARACTERISTICS OF GEOTHERMAL AREAS

Geothermal Area	Reservoir Type	Rock Character	Reservoir Depth (km)	Temperature (°C)
Geysers, CA	Dry steam	Hard	1.5-2.1	240
Imperial Valley, CA	Hot water	Soft-medium	0.7-3.6	190-370
Roosevelt Hot Springs, UT	Hot water	Hard	0.6-1.2	200-260
Baca Ranch, Valle Grande, NM	Hot water	Medium	1.2-1.8	200-260
Raft River, ID	Hot water	Hard	1.2-1.8	143-150
Jemez Caldera, NM	Hot dry rock	Hard	1.8-2.7	150-200
Marysville, MT	Hot water	Hard	1.8-2.1	93
Gulf Coast, TX and LA	Hot, high-pressured brine	Soft	3.0-5.0	140-200

TABLE 3. STATISTICAL SUMMARY OF JOINT EPA/ASTM INTERLABORATORY STUDY OF THE COLD VAPOR TECHNIQUE FOR TOTAL MERCURY IN WATER (34).

Number of laboratories	True values (μg/liter)	Mean value (μg/liter)	Standard deviation (μg/liter)	Accuracy as percent bias
76	0.21	0.349	0.276	66
80	0.27	0.414	0.279	53
82	0.51	0.674	0.541	32
77	0.60	0.709	0.390	18
82	3.4	3.41	1.49	0.34
79	4.1	3.81	1.12	-7.1
79	8.8	8.77	3.69	-0.4
78	9.6	9.10	3.57	-5.2

TABLE 4. EXPERIMENTAL CONDITIONS FOR VOA ANALYSIS

Column	1.8 m glass, 6 mm O.D. x 2 mm I.D. 0.1% SP1000 on Carbopack C
Carrier gas	Helium
Gas flow	20 ml/min
Temperature program	-30°C, rapidly raised to 50°C; 50°(0)-220°C at 8°/min; hold at 220°C for 16 min
Purging conditions	25 ml sample size; 600 ml purge volume
Trap dimensions	7.5 inches x 0.25 inch O.D. stainless steel
Backflushing	Backflush for 8 min at 200°C with helium at 20 ml/min with GC oven at -30°C
MS conditions	20-360 amu range; 6 msec/amu integration time; 150°C source temperature; 70 eV ionization energy; membrane separator

TABLE 5. EXPERIMENTAL CONDITIONS FOR SEMIVOLATILE ANALYSES

Column	1.8 m glass, 6 mm OD x 2 mm ID 1% SP1000 on 100/120 mesh Supelcoport (coal mining effluents only) Ultrabond (all other packed column work)
Carrier gas	Helium
Gas flow	30 ml/min
Temperature program	60°C for 2 min followed by 4°/min changes to 250°C and hold for 15 min (1% SP1000) 50°C for 4 min followed by 8°/min changes to 250°C (Ultrabond)
Injection port temperature	250°C
Mass range	20-500 amu (1% SP1000) 30-450 amu (Ultrabond)
Ion source temperature	150°C
Source pressure	2×10^{-6} torr (1% SP1000) 3×10^{-6} torr (Ultrabond)
Ionization energy	70 eV
Separator	Silicon membrane

TABLE 6. CAPILLARY GC/MS CONDITIONS

Column	30 m SE 30 wall coated open tubular glass column; 0.25 mm I.D.
Head pressure	16 psi
Carrier gas	UHP helium
Linear gas velocity	21 cm/sec
Temperature program	50°C (1 min) to 260°C at 5°/min
Injector temperature	240°C
Scan delay	4 min
Scan range	35 to 350 amu
Number of A/D points per amu	3
Scan speed	300 amu/sec
Ion source temperature	150°C
Ionization energy	70 eV
Type of separator	None, direct introduction of column effluent into source.
Sample size	1 µl of concentrated sample + 1 µl (40 ng) D-10 anthracene used as internal standard

TABLE 7. CONDITIONS FOR MSTFA DERIVATIZATION OF SEMIVOLATILE SAMPLES

Sample volume	100 µl of sample extract
Reagent volume	50 µl of MSTFA
Conditions for derivatization	Combine sample and MSTFA at room temperature; heat at 70°C for 15 min
MS conditions	Scan delay: 10 min Parameters are those described in Table 6

TABLE 8. COMPOUNDS INCLUDED IN VOLATILE STANDARDS

methylene chloride
acetone
carbon disulfide
1,1-dichloroethylene
1,1-dichloroethane
trans-1,2-dichloroethylene
chloroform
1,2-dichloroethane
1,1,1-trichloroethane
carbon tetrachloride
bromodichloromethane
1,2-dichloropropane
trans-1,2-dichloropropene
dibromochloromethane
trichloroethylene
1,1,2-trichloroethane
cis-1,3-dichloropropene
benzene
1,2-dibromoethane
bromoform
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
chlorobenzene
ethylbenzene
o-xylene
2-picolene
benzothiazole
n-hexane
ethylcyclopentane
3-methylhexane
n-octane
2-butanone
2-hexanone
5-methyl-3-heptanone
valeraldehyde
n-hexanol
ethyldimethylamine
phenylacetaldehyde
methylbromide
n-propylbenzene
p-dichlorobenzene
2-chloraethylbenzene
o-ethyltoluene
methanol
ethanol
isopropyl alcohol
n-butyl alcohol
2-butyl alcohol
1,2-bromoethane
2,2,3,4-tetramethylpentane
2-butoxyethanol
ethyl ether
ethyl acetate
3-methyl-2-butanone
cyclohexanone
3-hexanone
2-heptanone
trimethyl benzene
tetrahydrofuran
dehydrofuran
2,5-dimethylpyrrole
benzonitrile
2,3-benzofuran
acetonitrile
thiazole
2-methyl-5-ethylpyridine
cyclohexane
methylcyclohexane
n-heptane
3,5,5-trimethyl-1-hexene
p-ethyltoluene
2-pentanone
3-heptanone
2-octanone
2,3-dimethylpentane
benzaldehyde
diethyl-n-butylamine
n-nonane

TABLE 9. COMPOUNDS INCLUDED IN ACID STANDARD

chlorocyclohexane
phenylacetaldehyde
o-cresol
p-cresol
2,5-dimethylphenol
3-ethylphenol
4-isopropylphenol
2-t-butyl phenol
2,6-di-t-butylphenol
n-pentadecane
n-hexadecane
n-heptadecane
n-nonadecane
n-heneicosane
n-tricosane
n-pentacosane
phenol
2,4-dimethylphenol
4-chloro-m-cresol
diethylphthalate
isobutyric acid
butyric acid
pentanoic acid
hexanoic acid
octanoic acid
nonanoic acid
p-toluic acid
decanoic acid
dodecanoic acid
pentachlorophenol
n-octadecane
n-eicosane
n-docosane
n-tetracosane
o-chlorophenol
2-nitrophenol
2,4-dichlorophenol
2,4,6-trichlorophenol

TABLE 10. COMPOUNDS INCLUDED IN BASE/NEUTRAL STANDARDS

1,3-dichlorobenzene
1,4-dichlorobenzene
1,2-dichlorobenzene
bis(2-chloroisopropyl)ether
bis(2-chloroethyl)ether
nitrosodi-n-propylamine
isophorone
1,2,4-trichlorobenzene
naphthalene
nitrobenzene
bis(2-chloroethoxy)methane
2-chloronaphthalene
acenaphthene
acenaphthylene
hexachlorobenzene
dimethylphthalate
fluorene
1,2-diphenylhydrazene
diethylphthalate
4-bromophenyl phenyl ether
2,4-dinitrotoluene
phenanthrene
anthracene
pyrene
fluoranthene
bis(2-ethylhexyl)phthalate
chrysene
dibenzofuran
2,4-dimethoxyacetophenone
di-n-butylphthalate
triphenyl phosphate
di-n-octyl phthalate
cyclooctene
2,4,6-trimethylpyridine
2-methyl-5-ethylpyridine
benzothiazole
1-methylnaphthalene
cyclopropylphenylmethane
2,4-dimethylphenol
2,3-dimethylnaphthalene
p-dimethylaminobenzaldehyde
caffeine

1,2-benzanthracene
benzo(α)perylene
indenopyrene
benzidine
benzo(α)anthracene
n-octane
ethylbenzene
p-xylene
x-xylene
n-nonane
p-ethyltoluene
2-methylstyrene
o-ethyltoluene
1,2,4-trimethylbenzene
sec-butylbenzene
n-decane
dicyclopentadiene
dimethylaniline
cyclopropylphenylmethane
n-undecane
dibromobenzene
n-dodecane
2-methylnaphthalene
n-tridecane
biphenyl
n-tetradecane
2,3-dimethylnaphthalene
methyl-n-octadecanoate
trimethylnaphthalene
9,10-dimethyl anthracene
n-hexacosane
2,6-dimethylpyridine
benzonitrile
benzyl chloride
methyl-n-heptanoate
piperitone
tributyl phosphate
2-methyl-2-propyl-1,3-propanediol
2,6-dimethylquinoline
2,6-di-t-butyl-4-methylphenol
3,4-dimethoxyacetophenone

TABLE 11. ORGANIC COMPOUNDS IDENTIFIED IN EFFLUENTS FROM ENERGY-RELATED PROCESSES

Organic Compounds	Source of Effluents						
	Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
acenaphthene						X	
acetone		X	X	X	X	X	
acetonitrile			X		X	X	
acid isomer, $C_5H_{10}O_2$			X				
acid isomer, $C_6H_{10}O_2$			X				
acid isomer, $C_6H_{12}O_2$			X				
acid isomer, $C_7H_{12}O_2$			X				
acid isomer, $C_7H_{14}O_2$			X				
acid isomer, $C_8H_{14}O_2$			X				
acid isomer, $C_8H_{16}O_2$			X				
acid isomer, $C_9H_{16}O_2$			X				
acid isomer, $C_9H_{18}O_2$			X				
acid isomer, $C_{10}H_{18}O_2$			X				
acid isomer, $C_{10}H_{20}O_2$			X				
acid isomer, $C_{11}H_{20}O_2$			X				
acid isomer, $C_{11}H_{22}O_2$			X				
acid isomer, $C_{12}H_{22}O_2$			X				
acid isomer, $C_{12}H_{24}O_2$			X				
acid isomer, $C_{13}H_{24}O_2$			X				
acid isomer, $C_{13}H_{26}O_2$			X				
acid isomer, $C_{14}H_{28}O_2$			X				
acid isomer, $C_{15}H_{30}O_2$			X				
acid isomer, $C_{16}H_{30}O_2$			X				
acid isomer, $C_{16}H_{32}O_2$			X				
acid isomer, $C_{18}H_{34}O_2$			X				
acid isomer, $C_{18}H_{36}O_2$			X				
acid isomer, $C_{20}H_{40}O_2$			X				
alkane, C_8 branched isomer			X				
alkane, C_9 branched isomer			X				
alkane, C_{11} branched isomer			X				
alkane, C_{12} branched isomer			X			X	

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents: Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
alkane, C_{12} branched isomer			X			X	
alkane, C_{13} branched isomer			X			X	
alkane, C_{14} branched isomer			X			X	
alkane, C_{15} branched isomer			X			X	
alkane, C_{16} branched isomer		X	X			X	
alkane, C_{17} branched isomer		X	X			X	
alkane, C_{18} branched isomer		X	X			X	
alkane, C_{19} branched isomer		X	X			X	
alkane, C_{20} branched isomer			X				
alkane, C_{21} branched isomer			X			X	
alkane, C_{22} branched isomer			X			X	
alkane, C_{23} branched isomer			X			X	
alkane, C_{24} branched isomer		X	X			X	
alkane, C_{25} branched isomer			X			X	
alkane, C_{26} branched isomer			X				
alkane, C_{27} branched isomer			X				
alkane, C_{28} branched isomer						X	
alkane, C_{29} branched isomer						X	
alkane, C_{30} branched isomer			X				
alkane, C_{31} branched isomer			X				
alkane, C_{32} branched isomer			X				
alkane, C_{33} branched isomer			X				
alkene isomer, C_{13}						X	
alkene isomer, C_{14}						X	
alkene isomer, C_{15}						X	
alkene isomer, C_{18}						X	
alkene isomer, C_{19}						X	
amine, dimethyl							X
aniline, dimethyl						X	
anthracene				X			
benzaldehyde				X		X	

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents						
	Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
benzene	X	X	X	X	X	X	X
alkylbenzene, C_4						X	
alkylbenzene, C_5						X	
benzene, butyl						X	
benzene, dichloro				X		X	
benzene, diethyl						X	
benzene, ethyl	X		X	X	X	X	
benzene, isopropyl			X	X		X	
benzene, n-propyl			X	X	X	X	
benzene, t-butylchloro				X			
benzene, tetramethyl						X	
benzene, trimethyl	X		X			X	
benzofuran				X		X	
benzonitrile			X			X	
benzyl alcohol			X				
benzyl chloride				X			
biphenyl						X	
bromoform				X			
butyl alcohol				X			
butanone			X	X	X	X	
butanone, methyl				X		X	
caffine				X			
carbon disulfide	X		X	X	X	X	
chloroform	X	X	X	X	X	X	X
cresol		X	X		X	X	
cresol, chloro			X				
decane			X			X	
decanoic acid			X				
decene			X				
docosane		X	X	X		X	

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents: Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
docosane			X				
dodecane			X	X		X	
dodecanoic acid			X				
dodecene			X			X	
decene						X	
dotriacontane			X				
dotriacontene			X				
eicosane		X	X	X		X	
eicosanoic acid			X				
eicosene			X				
ethane, dichloro	X			X		X	
ethane, tetracloro	X			X			
ethane, trichloro	X		X	X			
ethanol				X			
ethanol, butoxy	X						
ethanol, butoxyethoxy	X						
ethyl acetate				X			
ethyl ether				X			
ethylene, dichloro	X			X			
ethylene, tetracloro	X			X			
ethylene, trichloro			X	X	X	X	
fluorene					X		
furan, dibenzo						X	
furan, tetrahydro						X	
heneicosane		X	X			X	
heneicosene			X				
hentriacontane			X				
hentriacontene			X				
heptacosane			X	X		X	
heptacosene			X				

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents						
	Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
heptadecane		X	X		X	X	
heptadecanoic acid			X				
heptadecene			X			X	
heptanoic acid			X				
heptanone			X	X		X	
hexacosane			X	X	X		
hexacosene			X				
hexadecane	X	X	X		X	X	
hexadecanoic acid			X				
hexadecene			X			X	
hexanol				X			
n-hexane	X		X	X		X	
hexane, cyclo		X			X	X	
hexane, dimethyl	X		X				
hexane, isobutylcyclo-				X			
hexane, methyl				X			
hexane, methylcyclo-		X	X	X	X	X	
hexane, trimethyl			X				
hexanoic acid			X				
hexanone			X	X		X	
hexanone, cyclo				X		X	
hexene, butylcyclo-				X			
indene						X	
isophorone				X			
isopropyl alcohol				X			
iopropylketone, methyl			X				
methane, bromodichloro				X			
methane, chlrordibromo				X			
methane, trichlorofluoro	X			X		X	
methanol			X	X			
methylene chloride	X	X	X	X	X	X	X

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents						
	Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
naphthalene				X	X	X	
naphthalene, C_2 alkyl						X	
naphthalene, C_3 alkyl						X	
naphthalene, dimethyl						X	
naphthalene, ethyl						X	
naphthalene, methyl					X	X	
naphthalene, trimethyl						X	
nonacosane			X			X	
nonacosene			X				
nonadecane		X	X		X	X	
nonadecene			X				
n-nonane			X			X	
nonanoic acid			X				
nonene						X	
octacosane			X			X	
octacosene			X				
octadecane		X	X	X		X	
octadecanoic acid			X				
octadecene			X			X	
n-octane			X			X	
octanoic acid			X				
octanone			X	X			
pentacosane			X	X		X	
pentacosene			X				
pentadecane		X	X			X	
pentadecene			X			X	
pentadecanoic acid			X				
pentane, dimethyl				X			
pentane, dimethylethyl			X				
pentane, ethylcyclo				X			
pentane, methylcyclo				X		X	

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents						
	Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
pentanoic acid			X				
pentanone			X			X	
pentanone, methyl			X			X	
pentanone, methylcyclo			X			X	
phenanthrene				X			
phenol		X	X		X	X	X
phenol, C_2 alkyl			X		X	X	
phenol, C_3 alkyl			X		X	X	
phenol, C_4 alkyl					X	X	
phenol, C_8 alkyl					X		
phenol, butylmethyl				X			
phenol, dichloro				X			
phenol, diethyl						X	
phenol, dimethyl			X		X	X	
phenol, ethyl			X		X	X	
phenol, ethylmethyl						X	
phenol, nitro			X				
phenol, propyl						X	
phenol, trimethyl						X	
phenylacetaldehyde				X		X	
phosphate, tributyl				X			
phthalate, bis(2-ethylhexyl)	X	X		X	X	X	
phthalate, dibutyl	X	X		X		X	
phthalate, diethyl	X			X	X	X	
phthalate, dimethyl				X			
phthalate, di-n-octyl	X			X			
phthalate, $C_{24}H_{38}O_4$						X	
propene, phenylmethyl				X			
pyran, dihydro			X			X	
pyridine, dimethyl			X				
pyridine, methyl			X			X	

(continued)

TABLE 11. (continued)

Organic Compounds	Source of Effluents						
	Coal strip mining	Oil refineries	Oil shale	Coal-fired power plants	Coal liquefaction	Coal gasification	Geothermal
pyridine, methylethyl			X				
pyridine, trimethyl			X				
pyrrole, dimethyl			X				
tetracosane		X	X	X	X	X	
tetracosene			X				
tetradecane			X		X	X	
tetradecanoic			X				
tetradecene			X				
thiophene			X	X		X	
thiophene, acetyl			X				
thiophene, methyl			X			X	
thiophene, trimethyl			X				
toluene	X	X	X	X	X	X	X
toluene, ethyl	X		X			X	
toluic acid			X				
triacontane			X			X	
triacontene			X				
tricosane		X	X	X	X	X	
tricosene			X				
tridecane			X			X	
tridecanoic acid			X				
tridecene	X		X	X		X	
styrene			X	X		X	
styrene, methyl					X	X	
undecane			X			X	
undecanoic acid			X				
undecene			X			X	
xylene	X		X	X	X		

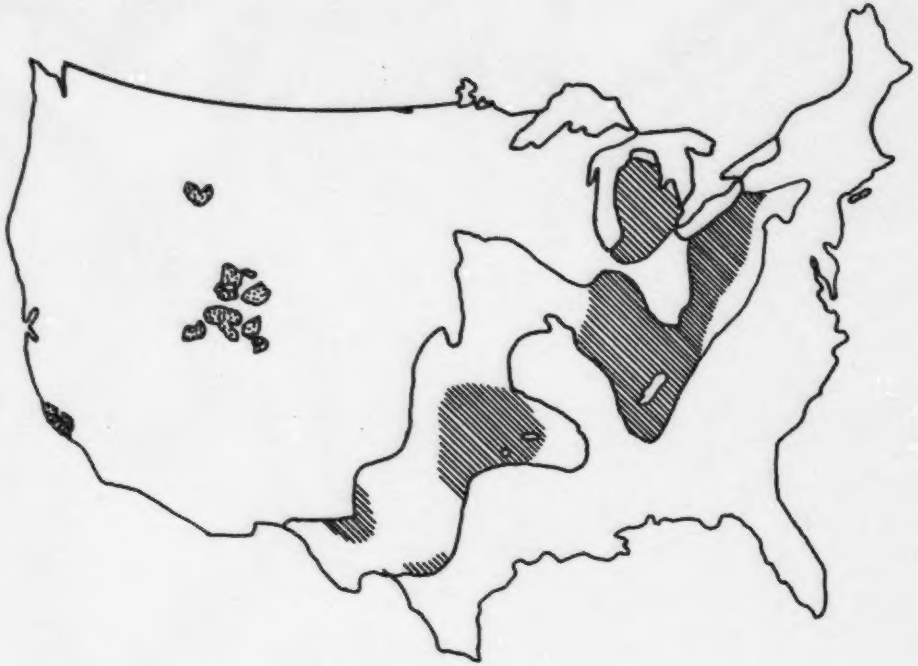

Figure 1. Location of oil shale deposits in the United States.

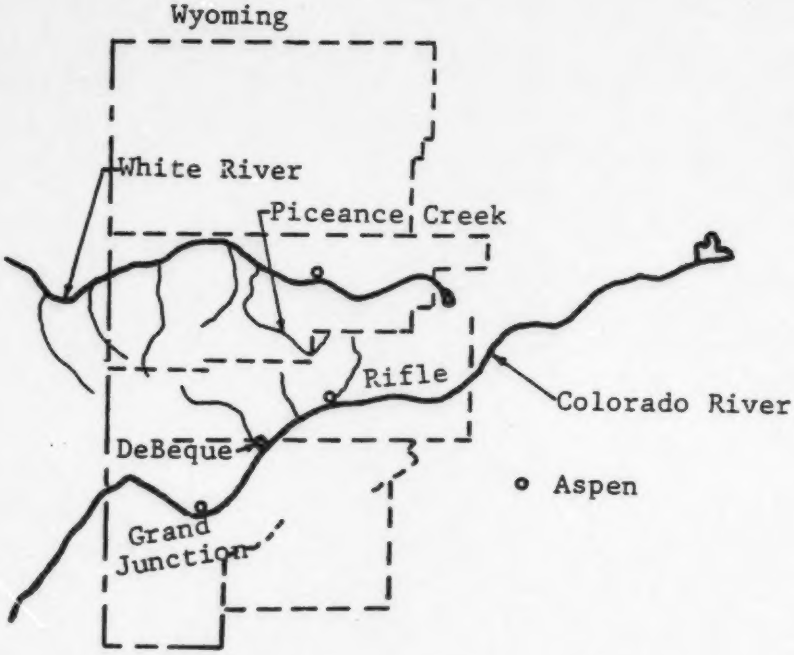

Figure 2. Location map of Piceane Creek Basin.

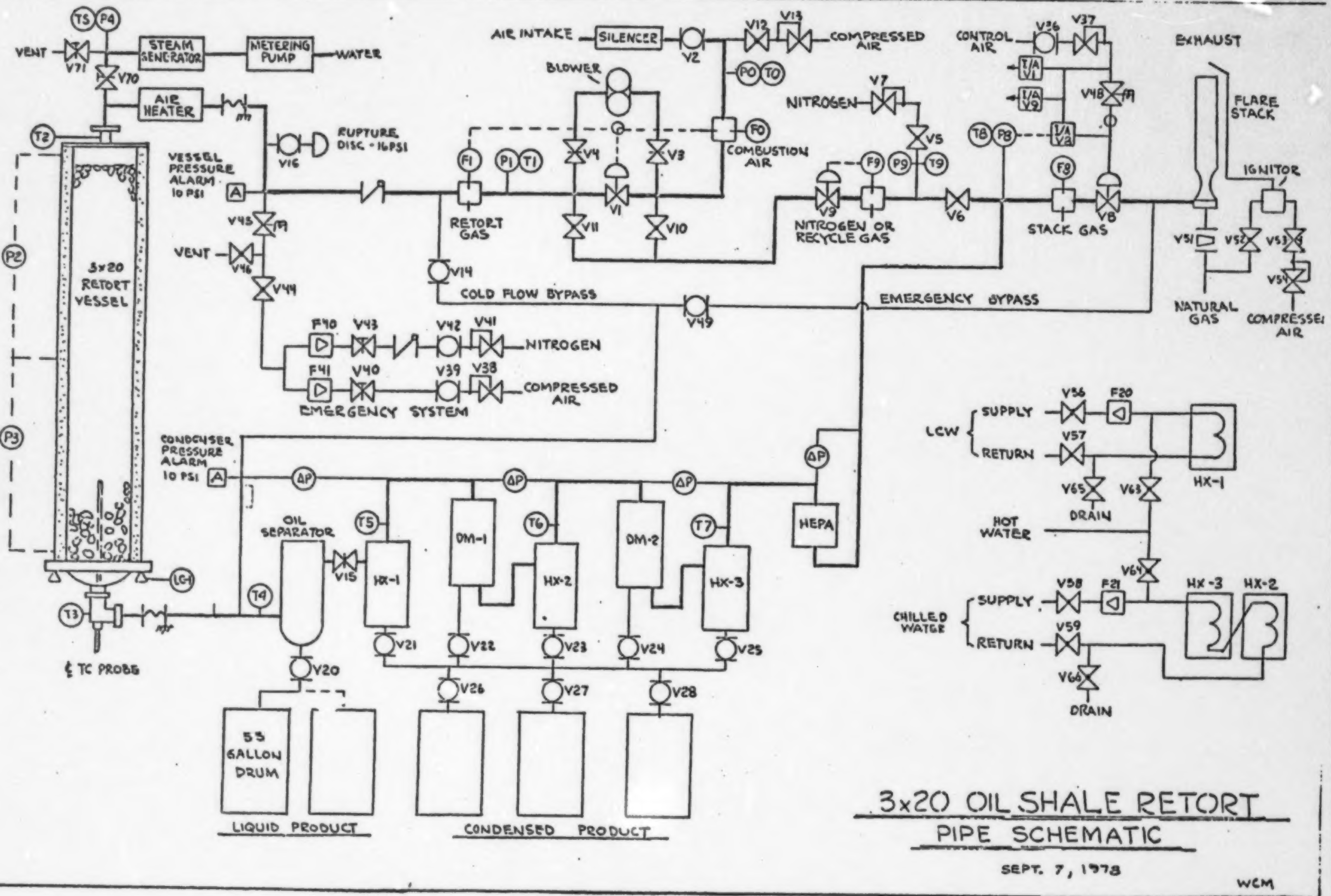

Figure 3. Schematic of Lawrence Livermore Laboratory experimental oil shale retort located in Livermore, California.

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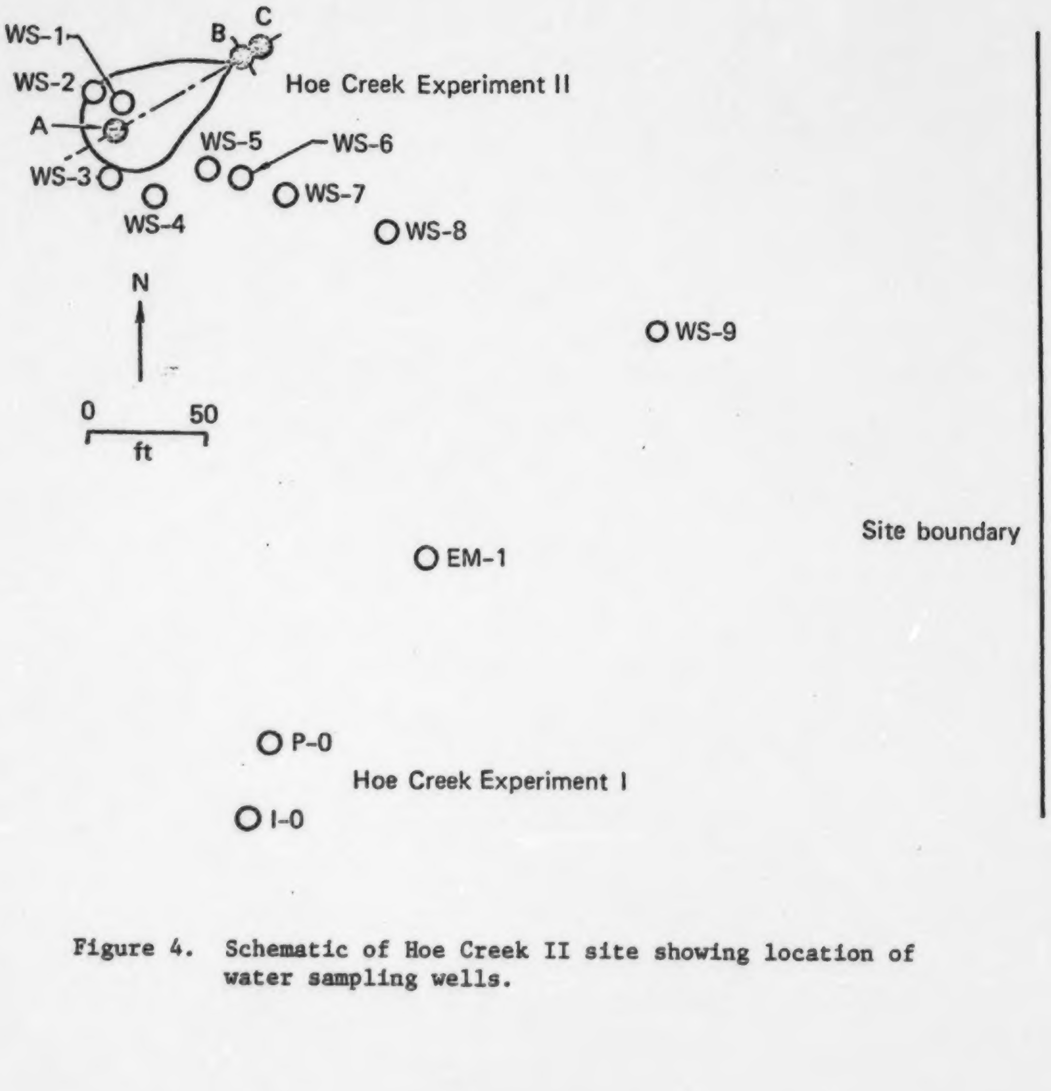


Figure 4. Schematic of Hoe Creek II site showing location of water sampling wells.

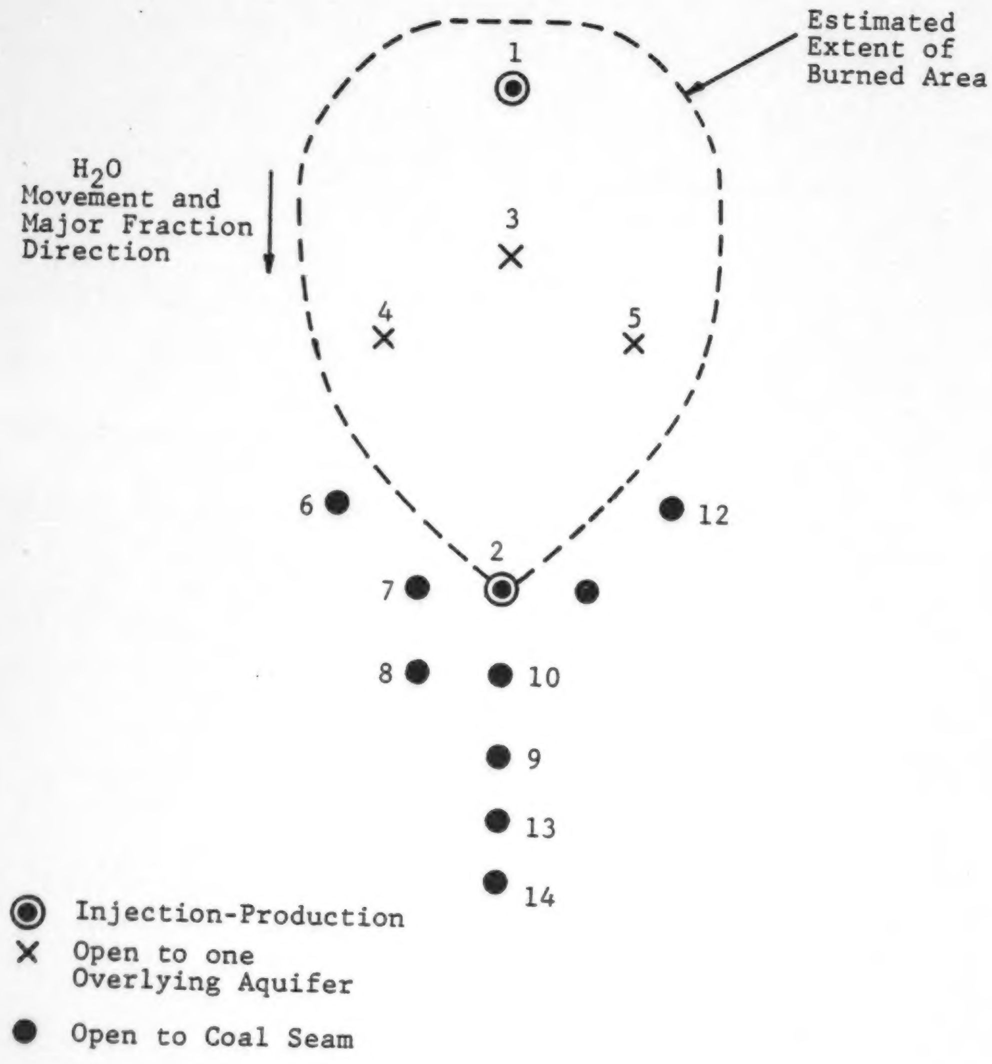

Estimated Extent of Burned Area
H_2O Movement and Major Fraction Direction
1
3
4
5
6
12
2
7
8
10
9
13
14
Injection-Production
Open to one Overlying Aquifer
Open to Coal Seam

Figure 5. Schematic of Hanna III site showing location of water sampling wells.

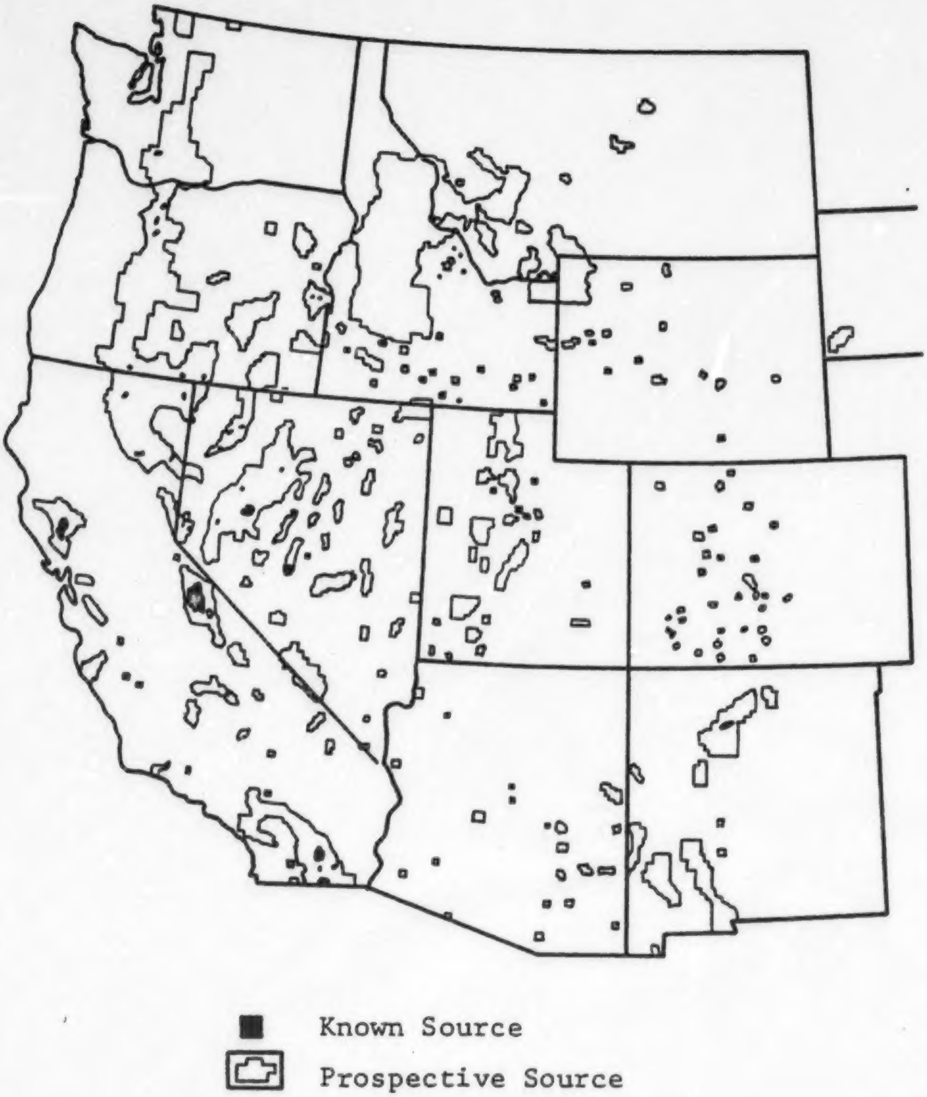


Figure 6. Geothermal resource areas in western United States.

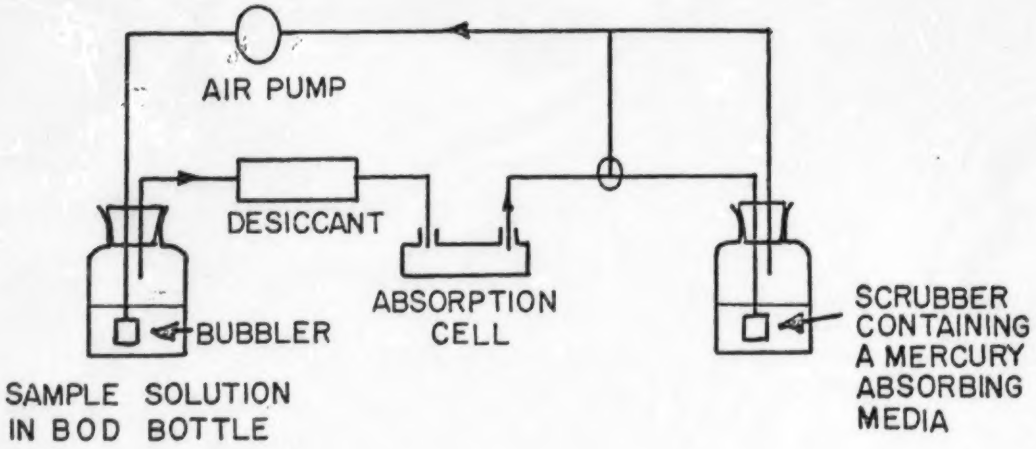

AIR PUMP
DESICCANT
ABSORPTION CELL
BUBBLER
SAMPLE SOLUTION IN BOD BOTTLE
SCRUBBER CONTAINING A MERCURY ABSORBING MEDIA

Figure 7. Schematic of apparatus used to determine mercury by flameless atomic absorption procedure.

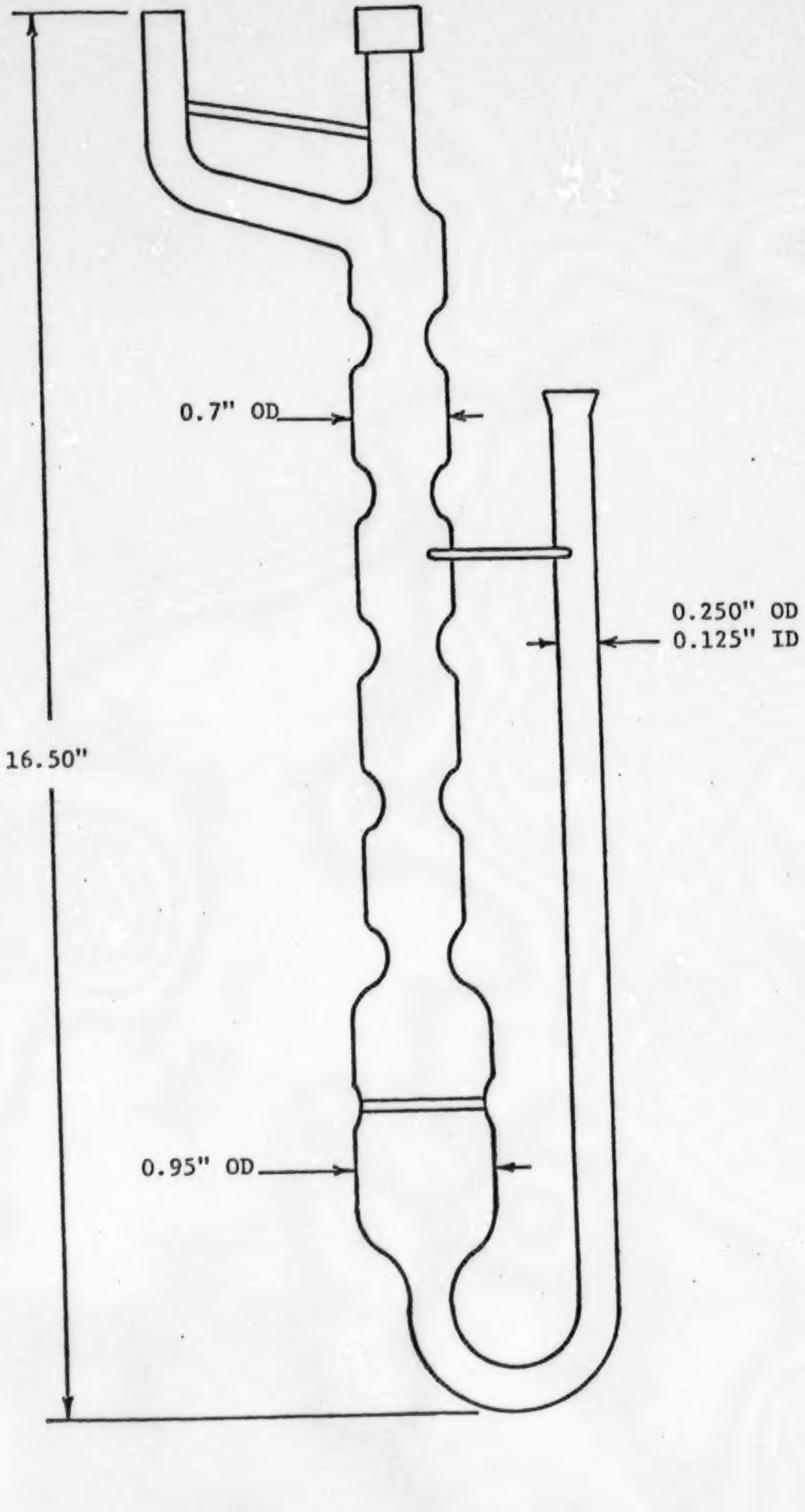


Figure 8. Glass sparging device.

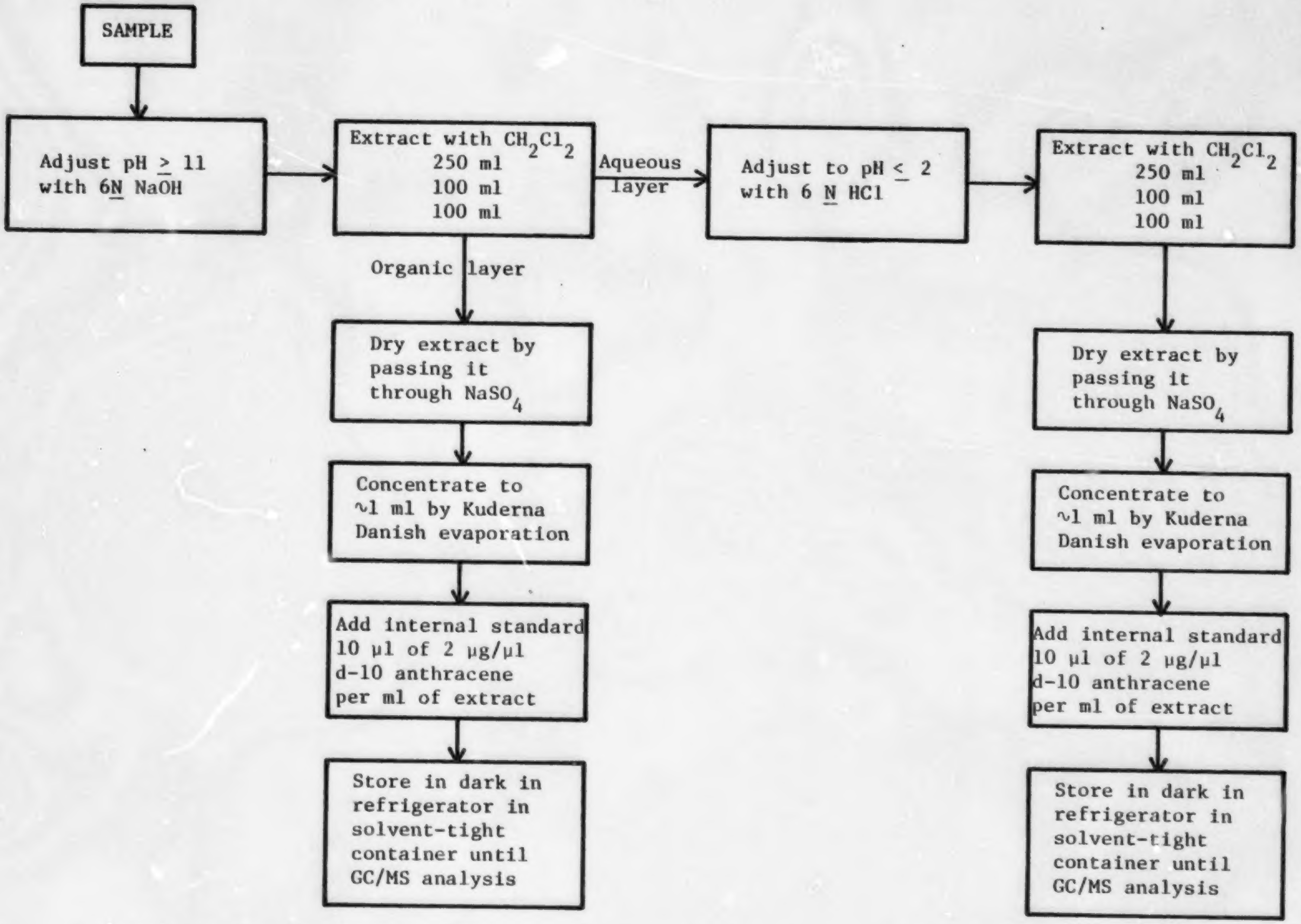

SAMPLE
Adjust pH ≥ 11 with 6N NaOH
Extract with CH_2Cl_2 250 ml 100 ml 100 ml
Aqueous layer
Organic layer
Adjust to pH ≤ 2 with 6 N HCl
Extract with CH_2Cl_2 250 ml 100 ml 100 ml
Dry extract by passing it through $NaSO_4$
Concentrate to ~1 ml by Kuderna Danish evaporation
Add internal standard 10 μl of 2 μg/μl d-10 anthracene per ml of extract
Store in dark in refrigerator in solvent-tight container until GC/MS analysis
Dry extract by passing it through $NaSO_4$
Concentrate to ~1 ml by Kuderna Danish evaporation
Add internal standard 10 μl of 2 μg/μl d-10 anthracene per ml of extract
Store in dark in refrigerator in solvent-tight container until GC/MS analysis

Figure 9. Extraction scheme for preparation of aqueous effluent samples for semivolatile analysis.

Key to Figure 10

1	carbon disulfide
2	thiophene
3	methylcyclopentane
4	1,2-DIBROMOETHANE (IS)
5	methylthiophene
6	di-n-propyl ether
7	2,2-dimethylhexane
8	n-butyl vinyl ether
9	cinnamaldehyde
10	dicyclopentadiene
11	styrene
12	o-dichlorobenzene
13	m-dichlorobenzene
14	ethyltoluene
15	indine
16	diethylbenzene

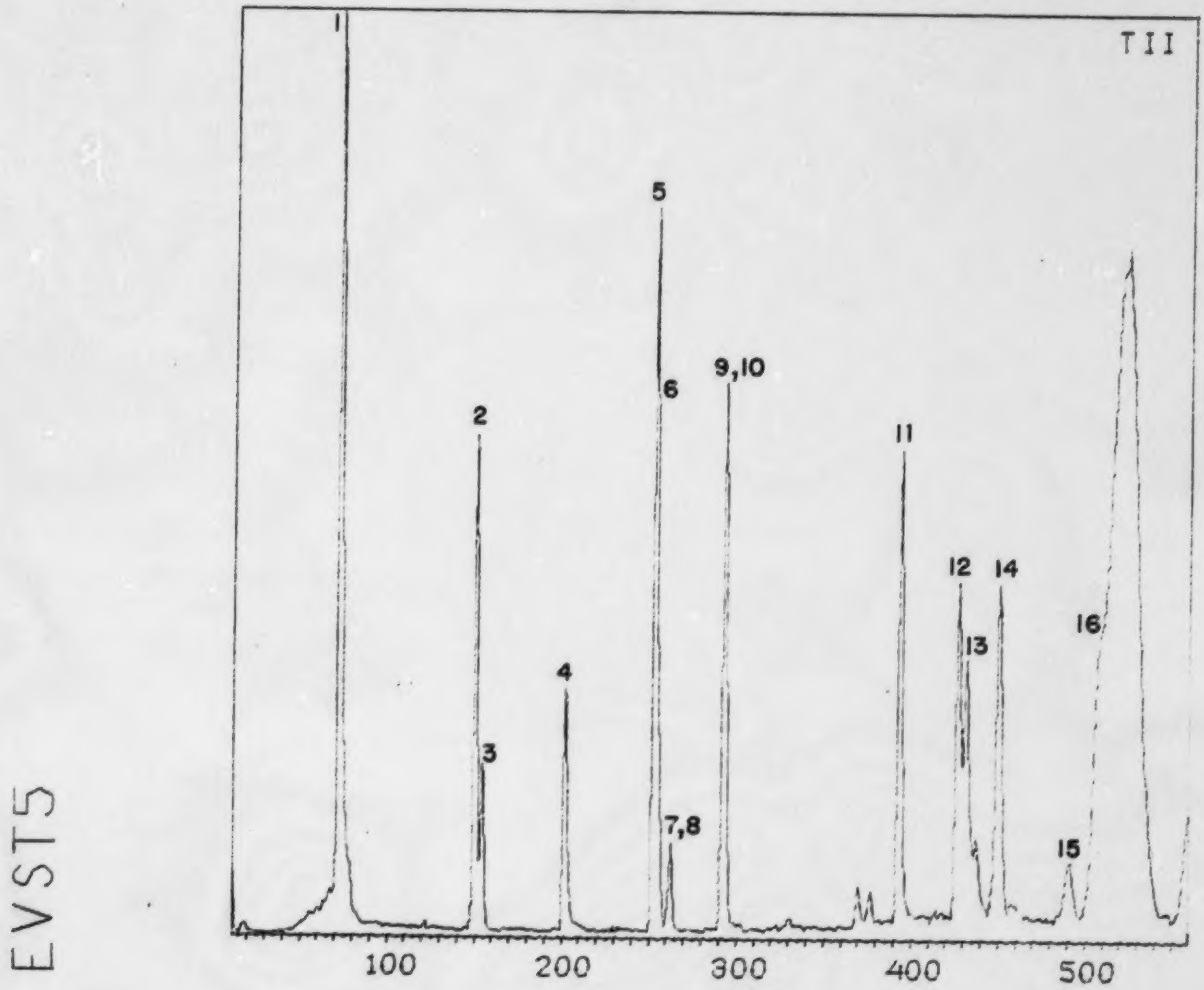
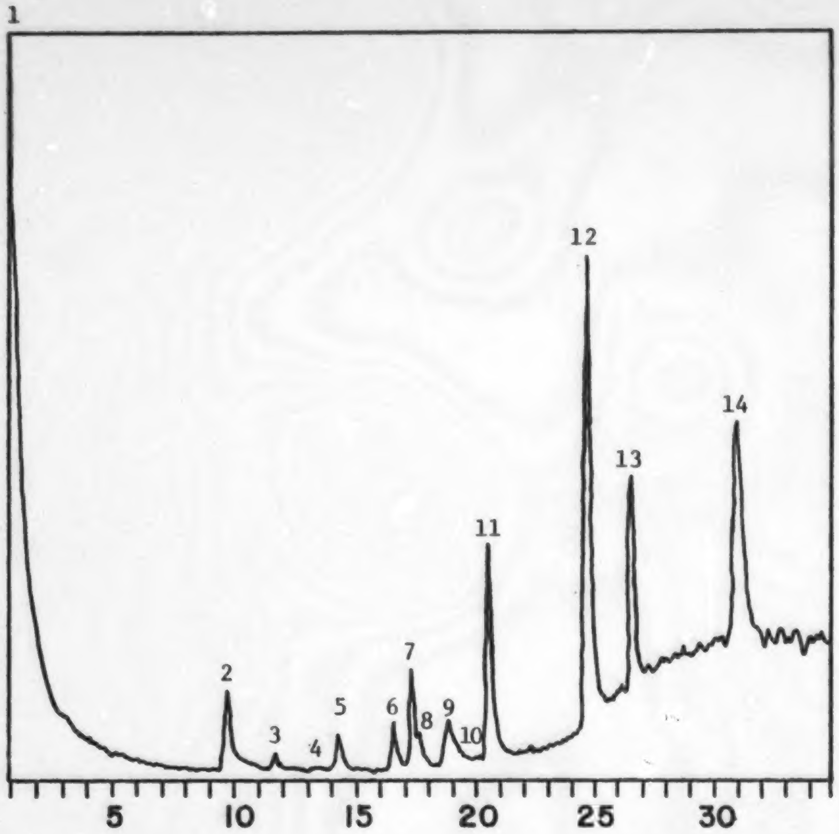


Figure 10. GC/MS chromatogram of energy VOA standard.



1	ethylbenzene
2	naphthalene
3	2-chlorophenol
4	phenol
5	2,4-dimethyl phenol
6	dimethyl phthalate
7	diethyl phthalate
8	2,6-dinitrotoluene
9	p-chloro-m-cresol 2,4-dinitrotoluene
10	2,4,6-trichlorophenol
11	phenanthrene dibutyl phthalate
12	fluoranthene bis(2-ethylhexyl)phthalate
13	butyl benzyl phthalate
14	chrysene

Figure 11. Total-ion current chromatogram of 22-component acid semivolatile standard mixture analyzed on packed column.

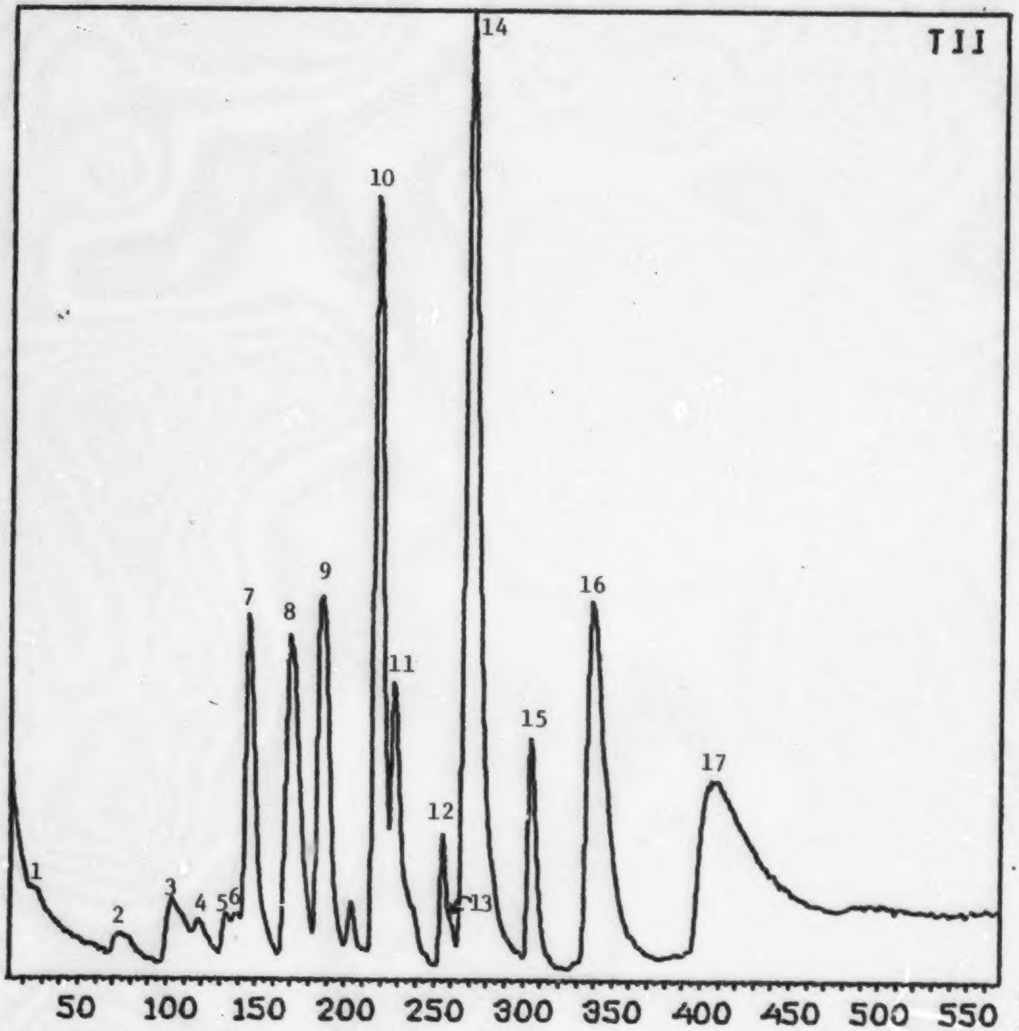


Figure 12. Total ion current chromatogram of a 33-compound base/neutral semivolatile standard mixture (60 ng each) analyzed on packed column.

1. Dichlorobenzenes (ortho-, meta-)
2. Hexachlorobutadiene
3. N-nitroso-di-n-propylamine
   Isophorone
   1,2,4-trichlorobenzene
4. Nitrobenzene
5. α-terpineol
6. Bis(2-chloroethoxy)methane
7. 1-methylnaphthalene
8. 1-chloronaphthalene
   2-chloronaphthalene
9. Acenaphthene
10. N-nitrosodiphenylamine
    4-chlorophenyl phenyl ether
11. 1,2-diphenylhydrazine
12. Heptachlor
    Hexachlorocyclopentadiene
13. o-phenyl phenol
14. Phenanthrene
    Anthracene
    d_{10}-ANTHRACENE STANDARD
15. Atrazine
    Benzidine
16. Pyrene
17. Chrysene
    1,2-benzanthracene

Not Seen
   Chlorobenzene*
   Ethylbenzene*
   Benzo(a)pyrene†
   Indeno(1,2,3-cd)pyrene†
   Dibenzo(a,h)anthracene†
   Benzo(g,h,i)perylene†

*Eluted before MS scanning started.
†Polynuclear aromatics.

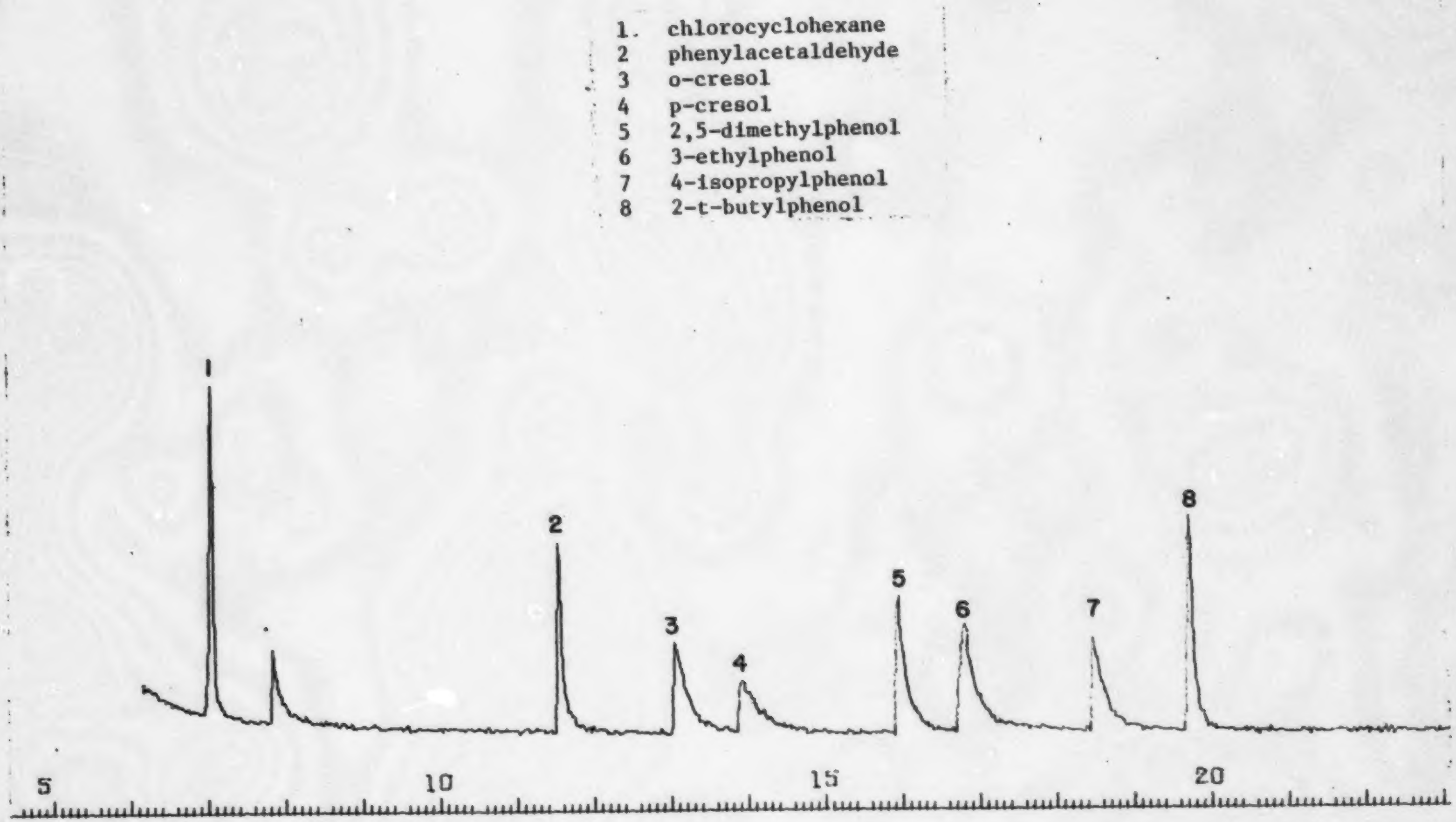


Figure 13. Total-ion current chromatogram of energy acid standard, underivatized, analyzed on capillary column.

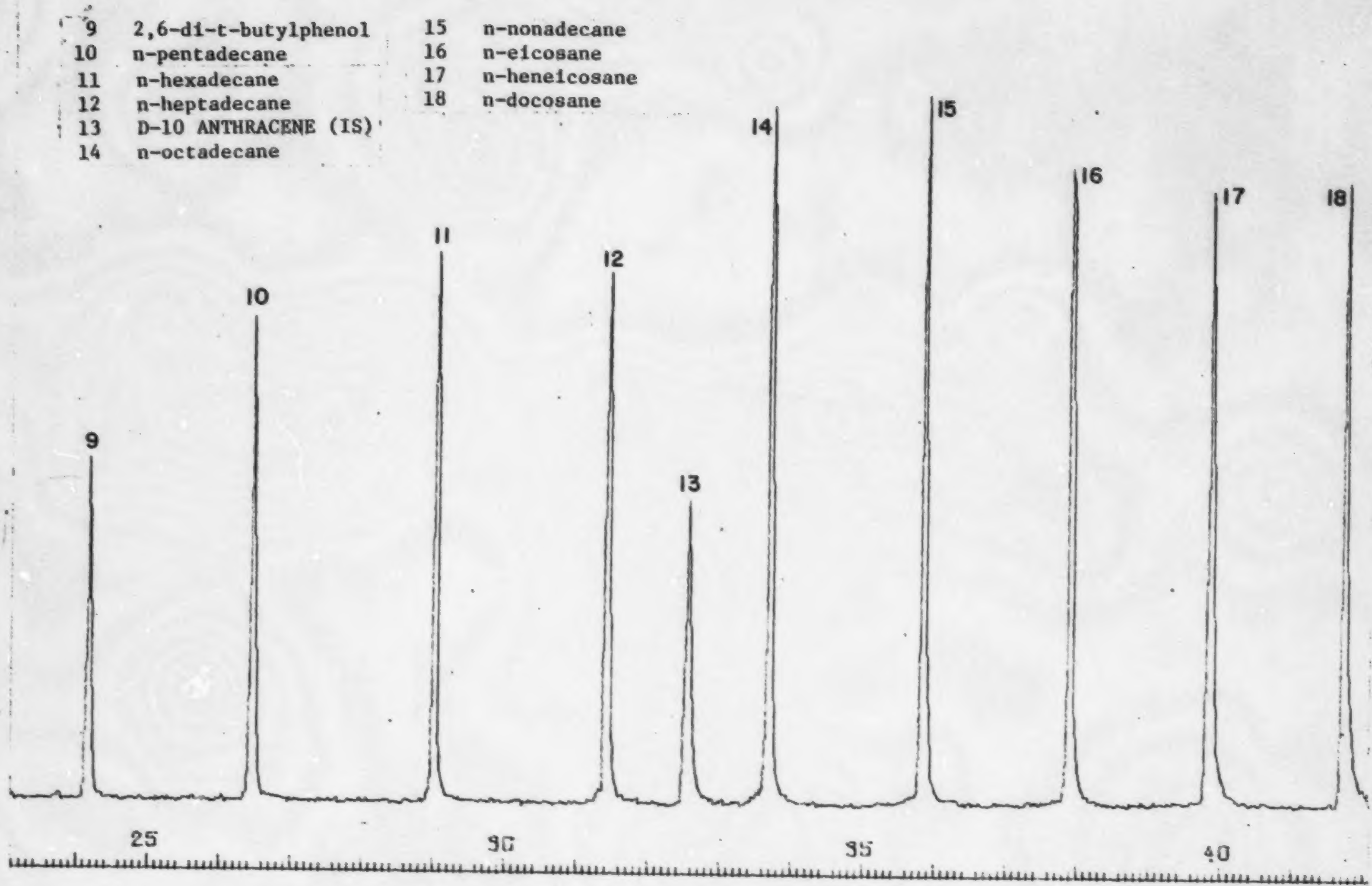


Figure 13 (continued).

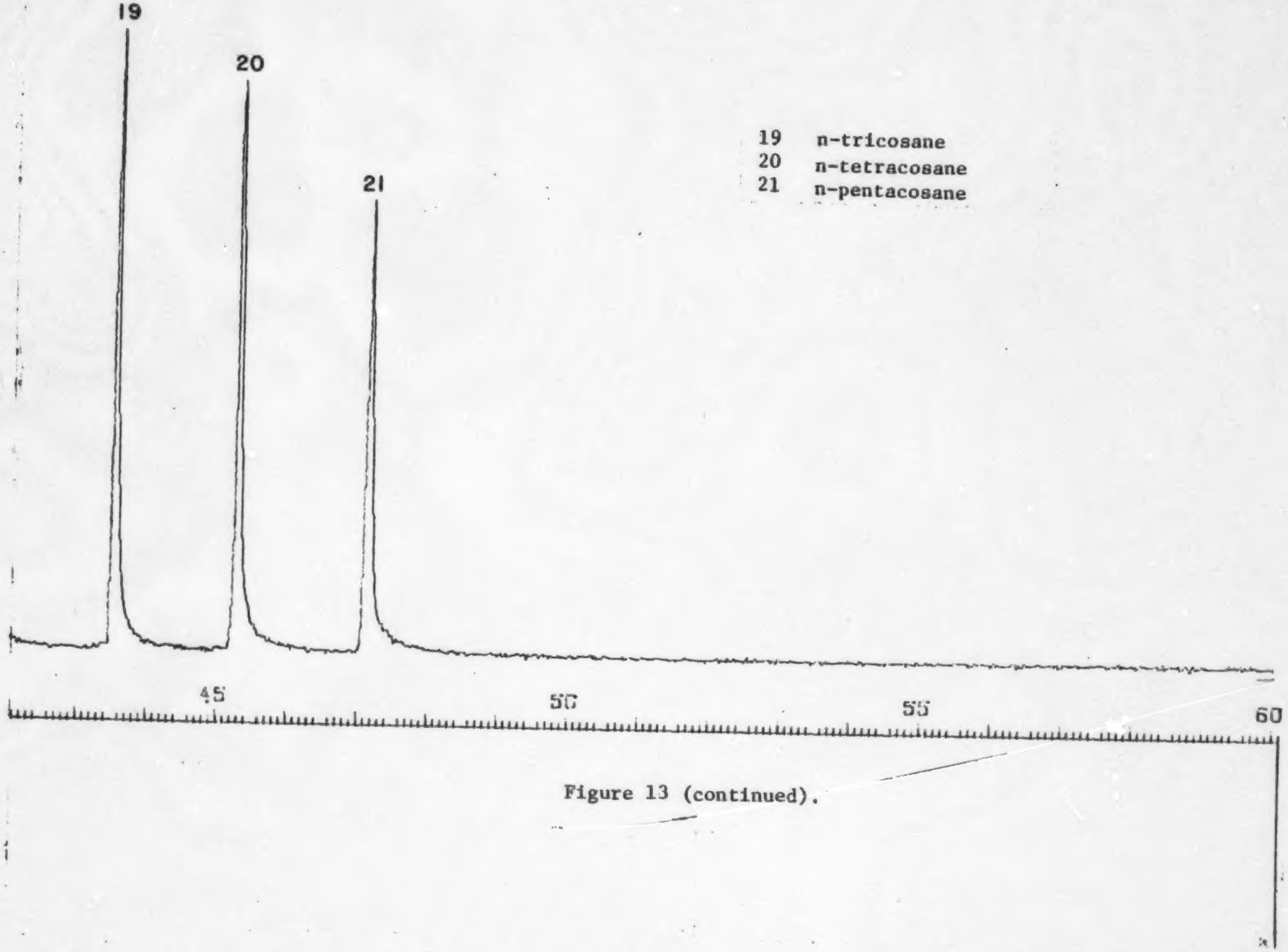


Figure 13 (continued).

Key to Figure 14

1	n-octane
2	ethylbenzene
3	p-xylene
4	o-xylene
5	n-nonane
6	p-ethyltoluene
7	2-methylstyrene + o-ethyltoluene
8	1,2,4-trimethylbenzene
9	sec-butylbenzene
10	n-decane
11	dicyclopentadiene
12	dimethylaniline
13	cyclopropylphenylmethane
14	n-undecane
15	D-4 dibromobenzene
16	n-dodecane
17	2-methylnaphthalene
18	n-tridecane
19	biphenyl
20	n-tetradecane
21	2,3-dimethylnaphthalene
22	dibenzofuran
23	2',4'-dimethoxyacetophenone
24	trimethylnaphthalene
25	D-10 ANTHRACENE (IS)
26	di-n-butyl phthalate
27	9,10-dimethylanthracene
28	triphenyl phosphate
29	n-hexacosane
30	di-n-octyl phthalate

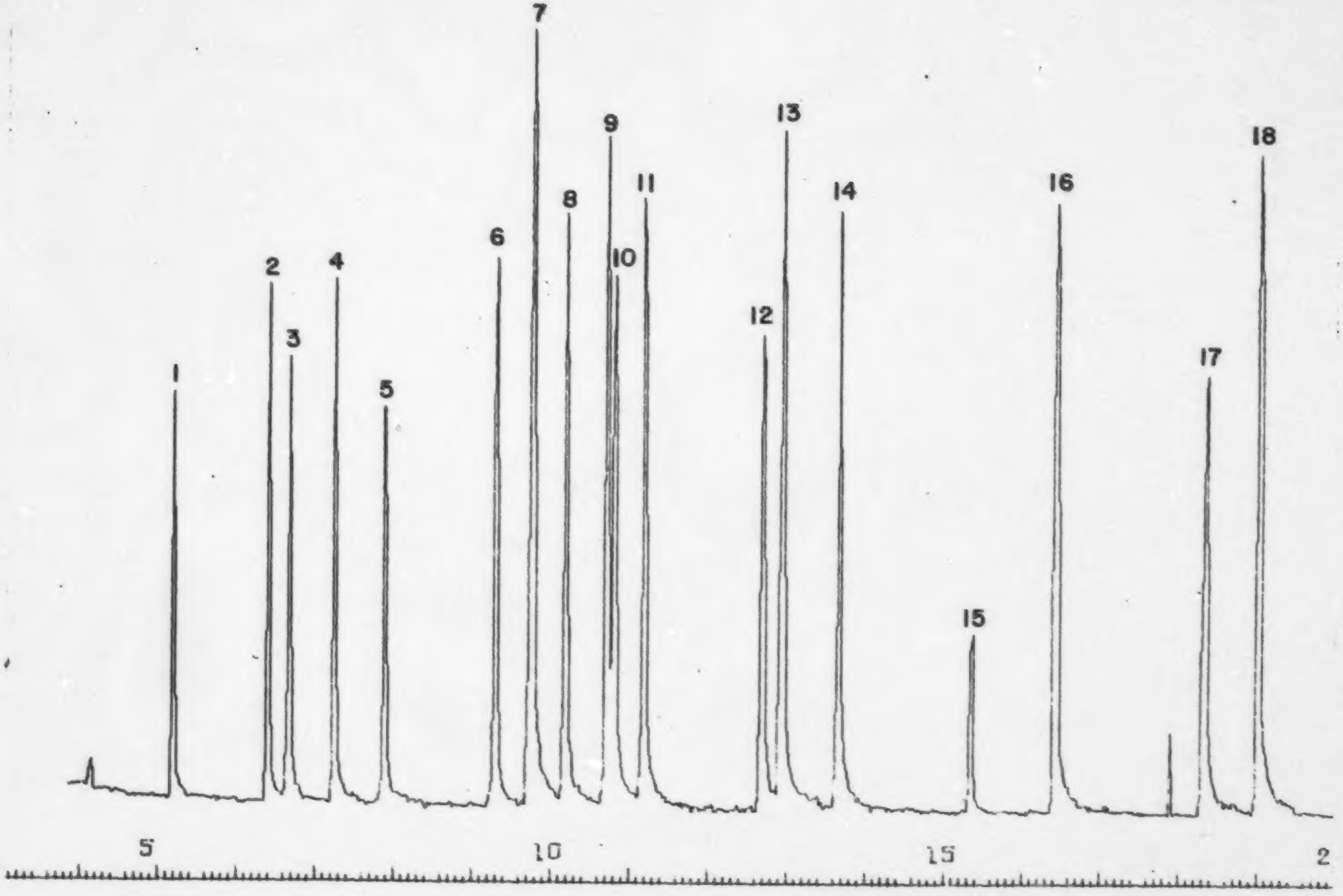


Figure 14. Total-ion current chromatogram of energy base/neutral standard A, underivatized, analyzed on capillary column.

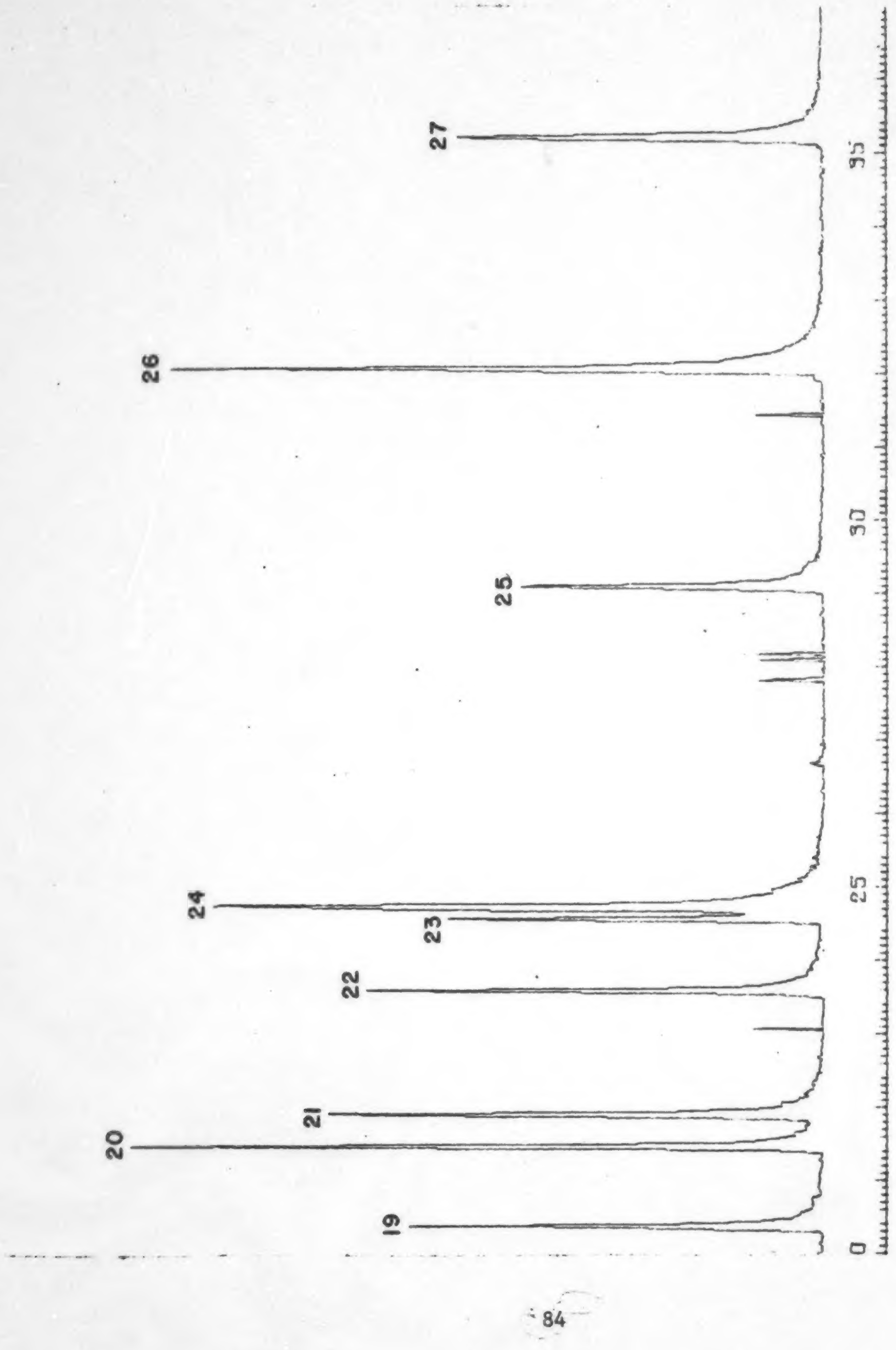


Figure 14 (continued).

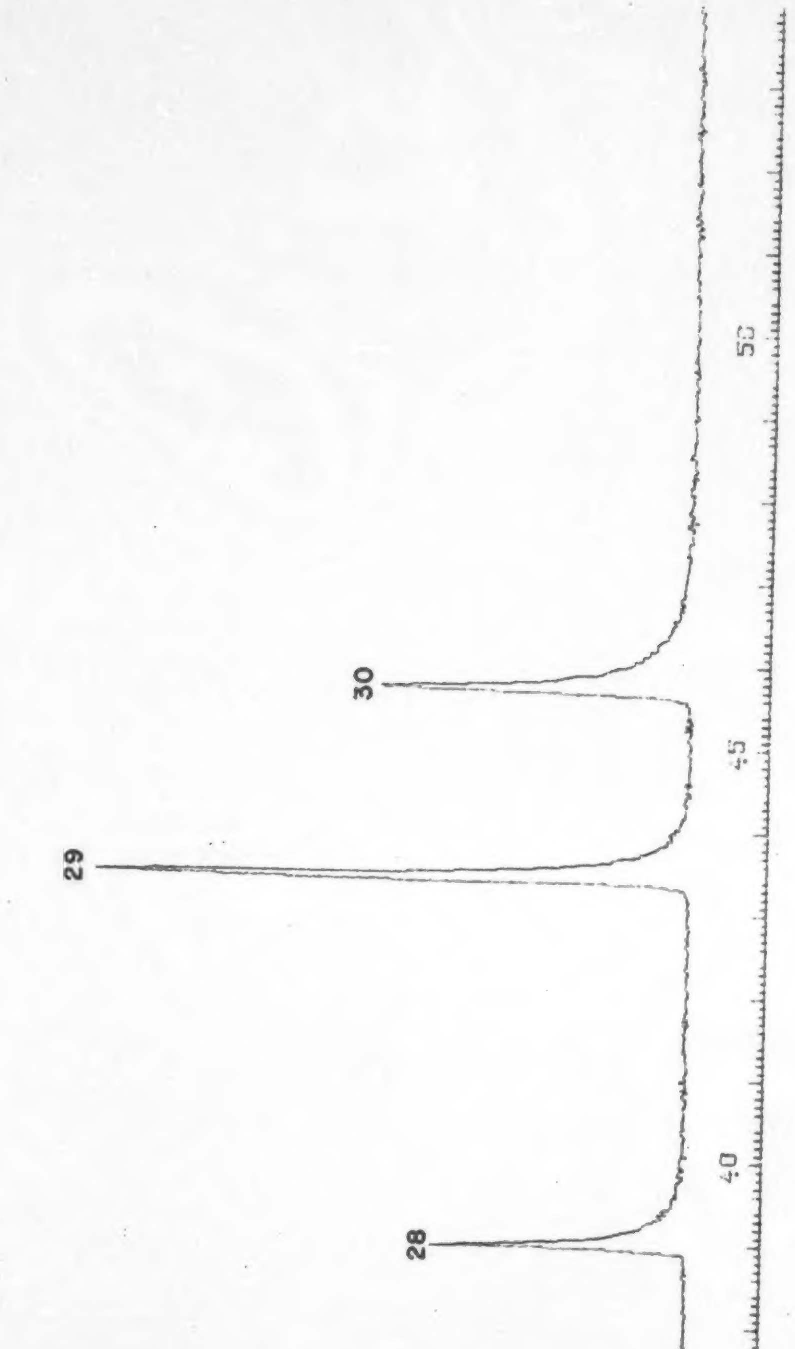


Figure 14 (continued).

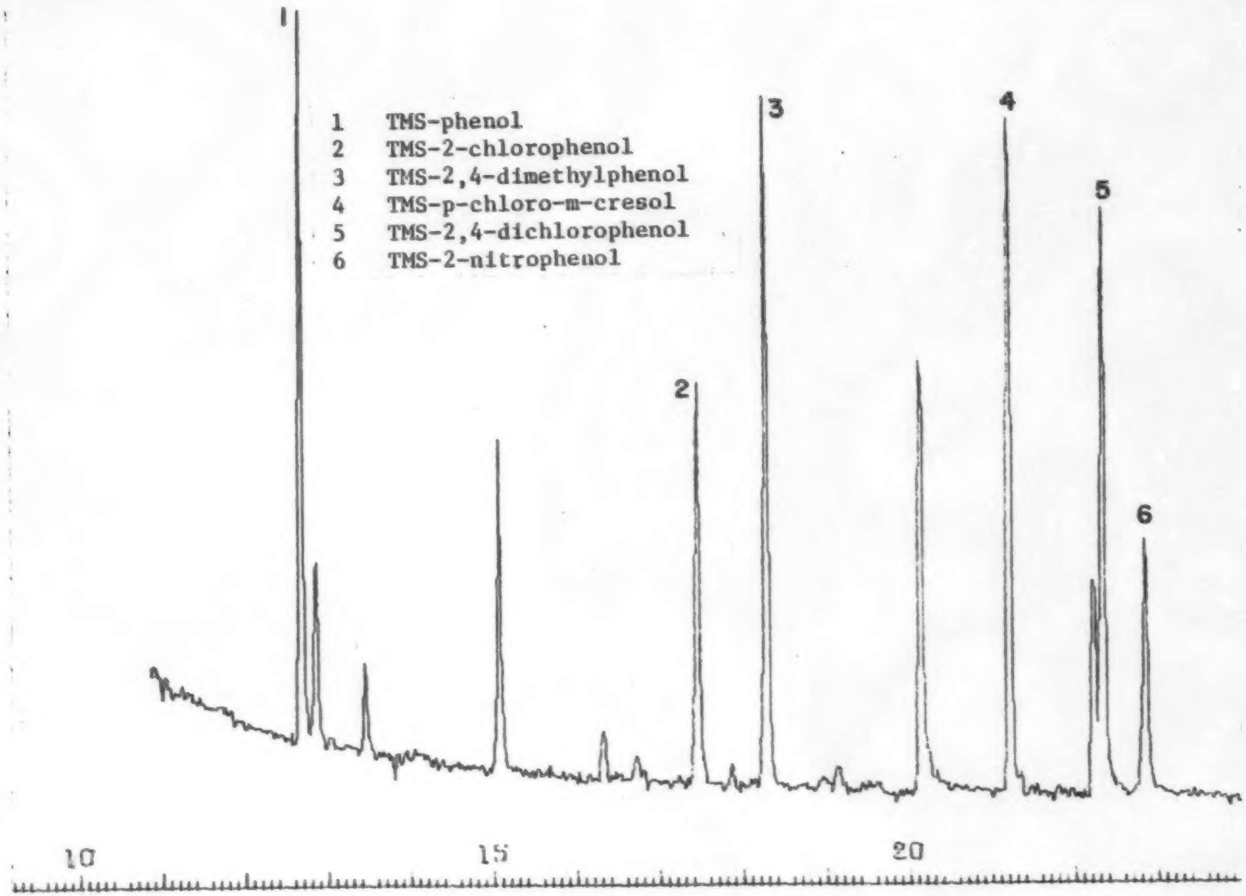


Figure 15. Total-ion current chromatogram of phenol standard, derivatized.

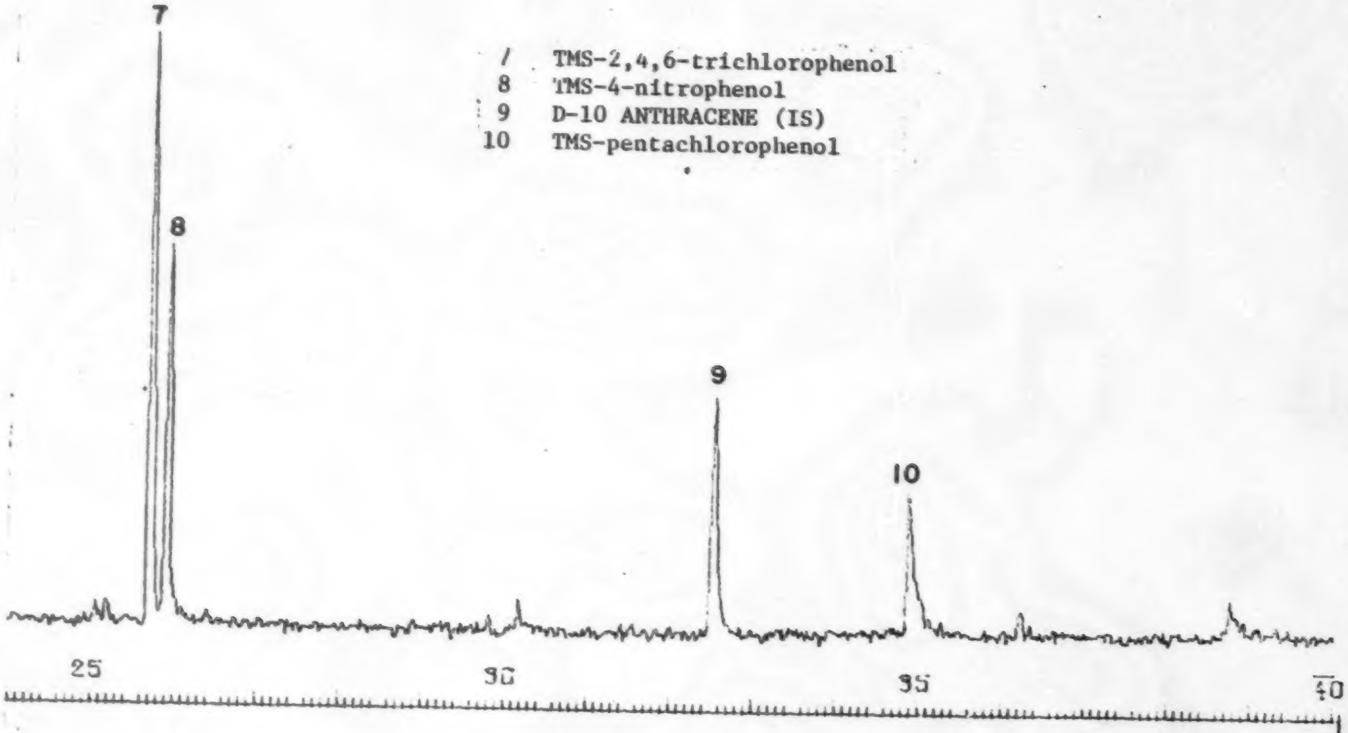


Figure 15 (continued).

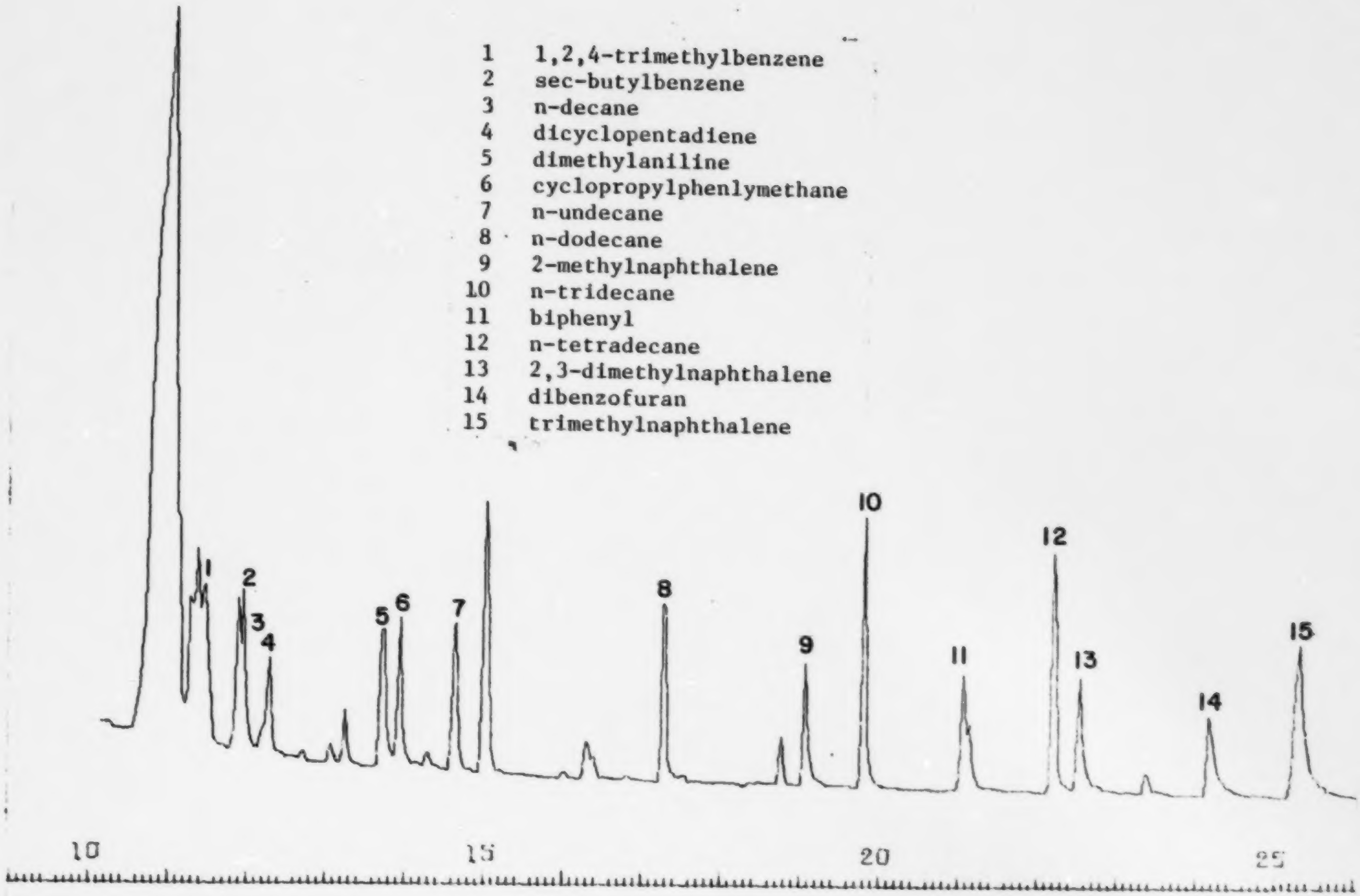


Figure 16. Total ion current chromatogram of energy base/neutral standard A, derivatized, analyzed on capillary column.

16	D-10 ANTHRACENE (IS)
17	di-n-butyl phthalate
18	9,10-dimethylanthracene
19	triphenyl phosphate

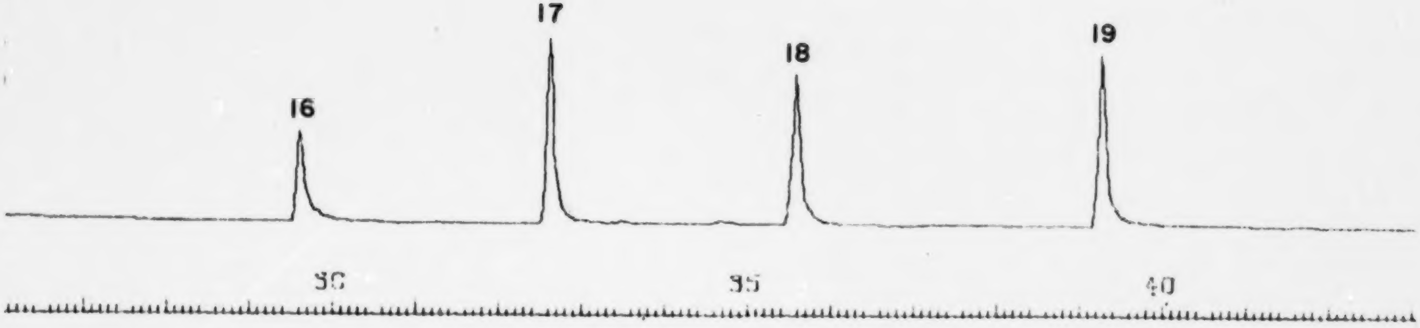


Figure 16. (continued).

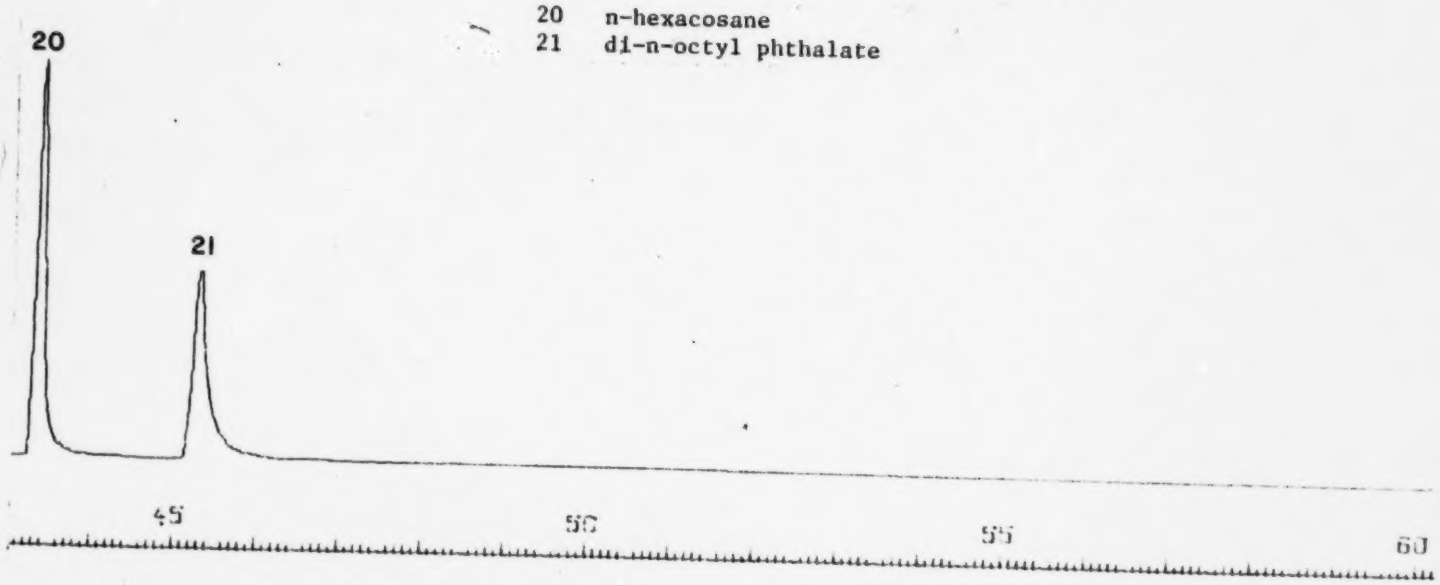


Figure 16. (continued).

APPENDIX A
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES FROM COAL STRIP MINING OPERATIONS - SAMPLE LIST

Organization	Site	Sample description	Sample code
Versar/EGD	W.MT	Water sample from Peter Kiewitt and Sons Decker No. 1 Mine	NC 104 VOA NC 107 A, B/N NC 101, A, B/N, BLK NC 1-12 Metals
Versar/EGD	MO	Water sample from Peabody Ben Veer Mine	NC 503 VOA NC 507 A, B/N NC 502 A, B/N, BLK NC 512 Metals
Versar/EGD	MO	Water sample from Peabody Ben Veer Mine	NC 516 VOA NC 518 A, B/N NC 523 Metals
Versar/EGD	MO	Water sample from Peabody Ben Veer Mine	NC 526 VOA NC 529 A, B/N NC 534 Metals
Versar/EGD	OH	Water sample from Peabody Sunnyhill Mine	T 513 VOA T 511 VOA, BLK T 531 A, B/N T 510 A, B/N, BLK T 560 Metals
Versar/EGD	TX	Water sample from Texas Power and Light Fairfield Mine	V 601 VOA V 625 VOA, BLK V 605 A, B/N V 624 A, B/N, BLK V 609 Metals
Versar/EGD	TX	Water sample from Texas Power and Light Fairfield Mine	V 613 VOA V 616 A, B/N V 620 Metals
Versar/EGD	IL	Water sample from Arch Mineral Captain Mine	NC 715 VOA NC 719 A, B/N NC 702 A, B/N, BLK NC 723 Metals
Versar/EGD	IL	Water sample from Arch Mineral Captain Mine	NC 726 VOA NC 730, A, B/N NC 734 Metals
Versar/EGD	PN	Water sample from Bettrami Enterprises Honeybrook Mine	V 705 VOA V 720 A, B/N V 702 A, B/N, BLK V 744 Metals
Versar/EGD	IN	Water sample from Amax Coal Company Ayshire Mine	NC 804 VOA NC 808 A, B/N NC 802, A, B/N, BLK NC 812 Metals
Versar/EGD	IN	Water sample from Amax Coal Company Ayshire Mine	NC 816 VOA NC 819, A, B/N NC 823 Metals
Versar/EGD	IN	Water sample from Amax Coal Company Ayshire Mine	NC 826 VOA NC 830 A, B/N NC 834 Metals

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 914 VOA NC 929 A, B/N NC 909 A, B/N, BLK NC 955 Metals
Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 917 VOA NC 931 A, B/N NC 958 Metals
Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 920 VOA NC 935 A, B/N NC 964 Metals
Versar/EGD	IL	Water sample from Peabody Coal Company Will Scarlet Mine	NC 971 VOA NC 974 A, B/N NC 967 A, B/N, BLK NC 969 Metals NC 979 Metals
Versar/EGD	KY	Water sample from Island Creek Coal Company Hamilton No. 1 Mine	NC 1004 VOA NC 1013 A, B/N NC 1001 A, B/N, BLK NC 1028 Metals
Versar/EGD	WV	Water sample from Valley Camp Coal Company	PN 1105 VOA PN 1111 A, B/N PN 1101 A, B/N, BLK PN 1119 Metals
Versar/EGD	WV	Water sample from Valley Camp Coal Company	PN 1126 VOA PN 1130 A, B/N PN 1134 Metals
Versar/EGD	W. KY	Water sample from Falcon Haddix Mine	NC 125-1 VOA NC 1213 A, B/N NC 1201 A, B/N, BLK NC 1228 Metals
Versar/EGD	W. KY	Water sample from Falcon Haddix Mine	NC 125-2 VOA NC 1215 A, B/N NC 1229 Metals
Versar/EGD	W. KY	Water sample from Falcon Haddix Mine	NC 126-1 VOA NC 126-2 VOA NC 1203 VOA, BLK
Versar/EGD	WV	Water sample from Eastern Association Coal Company Joanne Mine	NC 1437 VOA NC 1440 A, B/N NC 1402 A, B/N, BLK NC 1433 A, B/N, BLK NC 1434 Metals NC 1444 Metals
Versar/EGD	WV	Water sample from Bethlehem Boone 131 Mine	NC 1508 VOA NC 1547 A, B/N NC 1501 A, B/N, BLK NC 1503 Metals
Versar/EGD	WV	Water sample from Bethlehem Boone 131 Mine	NC 1509 VOA NC 1544 VOA NC 1505 A, B/N, BLK NC 1530 Metals NC 1551 Metals

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
Versar/EGD	VA	Water sample from Island Creek Coal Company Mine Pocahontas No. 3	NC 1626 VOA NC 1603 VOA, BLK NC 1630 A, B/N NC 1602 A, B/N, BLK NC 1634 Metals
Versar/EGD	TN	Water sample from Consolidated Coal Company Matthews No. 3 Mine	NC 1708 VOA NC 1712 A, B/N NC 1702 A, B/N, BLK NC 1716 Metals
Versar/EGD	TN	Water sample from Consolidated Coal Company Matthews No. 3 Mine	NC 1719 VOA NC 1723 A, B/N NC 1742 A, B/N, BLK NC 1727 Metals
Versar/EGD	Shannopin	Water sample from Jones and Laughlin	NC 1802 VOA NC 1865 A, B/N NC 1824 A, B/N, BLK NC 1858 A, B/N, BLK NC 1827 Metals NC 1849 Metals
Versar/EGD	PA	Water sample from National Mines Isabella Mine	NC 1936 NC 1929 A, B/N NC 1902 A, B/N, BLK NC 1930 A, B/N, BLK NC 1921 Metals
Versar/EGD	PA	Water sample from Duquesne Light Company Warwick Mine	NC 2021 VOA NC 20218 A, B/N NC 2027 A, B/N, BLK NC 20216 A, B/N, BLK NC 2028 Metals NC 20214 Metals
Versar/EGD	PA	Water sample from North American Coal Company Conemaugh No. 1 Mine	NC 2117 VOA NC 21105 VOA, BLK NC 2129 A, B/N NC 2102 A, B/N, BLK NC 2114 A, B/N, BLK NC 2103 Metals
Versar/EGD	OH	Water sample from Central Ohio Coal Company Muskingum Mine	NC 2209 VOA NC 2207 VOA, BLK NC 2214 A, B/N NC 2202 A, B/N, BLK NC 2218 Metals
Versar/EGD	OH	Water sample from Central Ohio Company Muskingum Mine	NC 2211 VOA NC 2230 A, B/N NC 2206 A, B/N, BLK NC 2238 Metals

TABLE A1. MERCURY ANALYSIS OF EFFLUENTS FROM COAL MINING OPERATION

Sample Number	Concentration ppb Hg
NC 512	1.0
NC 523	<0.2
NC 534	0.2
T 560	<0.2
V6 09	6.7
V6 20	2.8
NC 723	5.7
NC 734	0.8
NC 744	2.9
NC 812	3.4
NC 823	1.9
NC 834	4.4
NC 955	1.1
NC 958	1.1
NC 964	1.7
NC 969	7.7
NC 979	5.3
NC 1028	<0.2
PN 1119	6.0
PN 1134	4.6
NC 1228	2.8
NC 1229	3.2
NC 1434	<0.2
NC 1444	13.3
NC 1503	0.4
NC 1530	4.3
NC 1551	5.2
NC 1634	1.7
NC 1716	2.5
NC 1727	1.5
NC 1827	1.0
NC 1849	0.4
NC 1921	3.9
NC 2028	0.7
NC 20214	0.5
NC 2103	1.4
NC 2218	0.7
NC 2238	0.7

TABLE A2. SSMS DATA FOR SAMPLE NC 112.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈3	Neodymium	<0.001	Strontium	1
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.004	Sulfur	≥7
Arsenic	0.004	Gallium	0.002	Niobium	≤0.002	Tantalum	<0.001
Barium	0.2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.05	Thallium	<0.001
Boron	0.05	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.003	Praseodymium	0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	0.01	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.005	Rubidium	0.01	Uranium	0.2
Chlorine	4	Lead	0.01	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.001	Lithium	0.2	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.004
Copper	0.02	Magnesium	MC	Selenium	≤0.01	Zinc	0.02
Dysprosium	<0.001	Manganese	0.002	Silicon	1	Zirconium	0.02
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	>3		

NR-Not Reported

MC-Major Component

TABLE A3. SSMS DATA FOR SAMPLE NC 512.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈2	Neodymium	<0.001	Strontium	0.1
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	≥6
Arsenic	0.002	Gallium	0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	0.002	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	0.004	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.004	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	0.002	Iron	0.6	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.002	Uranium	<0.001
Chlorine	1	Lead	≤0.004	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.002	Lithium	0.003	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.01	Magnesium	4	Selenium	0.001	Zinc	0.02
Dysprosium	<0.001	Manganese	0.04	Silicon	MC	Zirconium	0.004
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE A4. SSMS DATA FOR SAMPLE NC 523.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.3	Fluorine	≈1	Neodymium	<0.001	Strontium	2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.003	Sulfur	>2
Arsenic	0.01	Gallium	0.001	Niobium	≤0.002	Tantalum	<0.001
Barium	0.1	Germanium	≤0.002	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.003	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	≤0.001	Iodine	0.002	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	0.003	Iron	0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.01	Uranium	0.02
Chlorine	1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.02	Lithium	0.01	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	≤0.002
Copper	0.01	Magnesium	MC	Selenium	0.005	Zinc	0.02
Dysprosium	<0.001	Manganese	0.02	Silicon	MC	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A5. SSMS DATA FOR SAMPLE NC 534.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈1	Neodymium	<0.001	Strontium	1
Antimony	0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>2
Arsenic	0.01	Gallium	0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.04	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.04	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	<0.001	Iodine	0.004	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	0.001	Iron	0.01	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.003	Uranium	0.01
Chlorine	1	Lead	≤0.002	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	0.04	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	≤0.002
Copper	0.01	Magnesium	MC	Selenium	0.002	Zinc	0.01
Dysprosium	<0.001	Manganese	0.002	Silicon	1	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A6. SSMS DATA FOR SAMPLE T560.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≃1	Neodymium	<0.001	Strontium	4
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.1	Sulfur	>6
Arsenic	≤0.004	Gallium	≤0.003	Niobium	0.01	Tantalum	<0.001
Barium	0.05	Germanium	≤0.005	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.04	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	<0.02
Cerium	0.001	Iron	0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.02	Uranium	<0.001
Chlorine	MC	Lead	0.01	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.02	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.03	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.003
Copper	0.01	Magnesium	MC	Selenium	0.01	Zinc	0.1
Dysprosium	<0.001	Manganese	MC	Silicon	1	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>3		

NR-Not Reported

MC-Major Component

TABLE A7. SSMS DATA FOR SAMPLE V609.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≃0.4	Neodymium	0.003	Strontium	0.5
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>7
Arsenic	0.002	Gallium	0.004	Niobium	≤0.003	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	4	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.01
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.004	Praseodymium	0.002	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.3
Cerium	0.01	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.001	Lanthanum	0.01	Rubidium	0.01	Uranium	0.01
Chlorine	0.07	Lead	0.02	Ruthenium	<0.001	Vanadium	0.009
Chromium	0.01	Lithium	0.02	Samarium	0.005	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.004
Copper	0.01	Magnesium	MC	Selenium	0.007	Zinc	0.06
Dysprosium	<0.001	Manganese	0.4	Silicon	9	Zirconium	0.02
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.005	Sodium	>3		

NR-Not Reported

MC-Major Component

TABLE A8. SSMS DATA FOR SAMPLE V620.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>2	Fluorine	≈0.8	Neodymium	0.01	Strontium	2
Antimony	≤0.004	Gadolinium	<0.001	Nickel	0.01	Sulfur	MC
Arsenic	0.003	Gallium	0.003	Niobium	<0.001	Tantalum	<0.001
Barium	1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.4	Thallium	<0.001
Boron	0.04	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.05	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.005	Praseodymium	0.01	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.3
Cerium	0.02	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.02	Rubidium	0.01	Uranium	<0.001
Chlorine	0.3	Lead	0.01	Ruthenium	<0.001	Vanadium	0.02
Chromium	0.01	Lithium	0.01	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.004	Lutetium	<0.001	Scandium	≤0.003	Yttrium	0.01
Copper	0.01	Magnesium	MC	Selenium	0.01	Zinc	0.1
Dysprosium	<0.001	Manganese	0.2	Silicon	MC	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.1	Sodium	>6		

NR-Not Reported

MC-Major Component

TABLE A9. SSMS DATA FOR SAMPLE NC 723.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.4	Fluorine	≈1	Neodymium	0.001	Strontium	0.003
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>2
Arsenic	0.002	Gallium	0.001	Niobium	0.004	Tantalum	<0.001
Barium	0.08	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.06	Thallium	<0.001
Boron	0.08	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.07	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	<0.001	Iodine	0.007	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.02
Cerium	0.007	Iron	0.4	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.1	Uranium	0.03
Chlorine	5	Lead	0.005	Ruthenium	<0.001	Vanadium	0.003
Chromium	0.004	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.001
Copper	0.005	Magnesium	MC	Selenium	≤0.002	Zinc	0.06
Dysprosium	<0.001	Manganese	0.02	Silicon	3	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	<0.001	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A10. SSMS DATA FOR SAMPLE NC 734.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.003	Fluorine	≈1	Neodymium	<0.001	Strontium	3
Antimony	0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>2
Arsenic	≤0.001	Gallium	≤0.3	Niobium	<0.001	Tantalum	≤0.01
Barium	0.03	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.01	Thallium	<0.001
Boron	0.2	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	0.001	Iodine	0.01	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.004
Cerium	0.001	Iron	0.02	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.01	Uranium	0.01
Chlorine	2	Lead	0.005	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.001	Lithium	0.3	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	≤0.004	Zinc	0.004
Dysprosium	<0.001	Manganese	0.002	Silicon	1	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A11. SSMS DATA FOR SAMPLE V744.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.3	Fluorine	≈0.4	Neodymium	0.001	Strontium	0.1
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.1	Sulfur	>2
Arsenic	0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.3	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	<0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	0.001	Iodine	0.001	Praseodymium	0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.02
Cerium	0.003	Iron	0.3	Rhodium	<0.001	Tungsten	≤0.002
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.01	Uranium	≤0.003
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.05	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.001
Copper	0.04	Magnesium	10	Selenium	0.002	Zinc	0.2
Dysprosium	<0.001	Manganese	>3	Silicon	1	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A12. SSMS DATA FOR SAMPLE NC 812.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.1	Fluorine	≃1	Neodymium	<0.001	Strontium	0.2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>6
Arsenic	0.002	Gallium	0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.04	Thallium	<0.001
Boron	0.04	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.005	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	<0.001	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.001	Uranium	<0.001
Chlorine	4	Lead	≤0.004	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.001	Lithium	0.01	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.002
Copper	0.01	Magnesium	MC	Selenium	≤0.003	Zinc	0.01
Dysprosium	<0.001	Manganese	0.01	Silicon	2	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	3		

NR-Not Reported

MC-Major Component

*Heterogeneous

TABLE A13. SSMS DATA FOR SAMPLE NC 823.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈5	Neodymium	<0.001	Strontium	1
Antimony	0.01	Gadolinium	<0.001	Nickel	INT	Sulfur	>4
Arsenic	0.01	Gallium	0.005	Niobium	<0.001	Tantalum	<0.001
Barium	0.2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.2	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	>8	Thulium	<0.001
Cadmium	<0.001	Iodine	0.01	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.02
Cerium	<0.001	Iron	0.03	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.01	Uranium	0.01
Chlorine	MC	Lead	0.005	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.002	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.04	Magnesium	MC	Selenium	0.004	Zinc	0.02
Dysprosium	<0.001	Manganese	0.003	Silicon	9	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	>2		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A14. SSMS DATA FOR SAMPLE NC 834.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈8	Neodymium	0.003	Strontium	1
Antimony	0.001	Gadolinium	0.001	Nickel	0.1	Sulfur	>2
Arsenic	0.001	Gallium	0.002	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	<0.001	Iodine	<0.001	Praseodymium	0.001	Tin	0.003
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.002	Iron	0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.004	Rubidium	0.01	Uranium	≤0.003
Chlorine	0.03	Lead	0.01	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.001	Lithium	0.1	Samarium	0.003	Ytterbium	<0.001
Cobalt	0.03	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.01
Copper	0.01	Magnesium	MC	Selenium	0.001	Zinc	0.1
Dysprosium	<0.001	Manganese	>4	Silicon	1	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	0.001	Molybdenum	0.03	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A15. SSMS DATA FOR SAMPLE NC 955.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	=MC	Neodymium	0.001	Strontium	1
Antimony	0.001	Gadolinium	<0.001	Nickel	0.03	Sulfur	>3
Arsenic	0.01	Gallium	≤0.001	Niobium	<0.001	Tantalum	**0.01
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.5	Thallium	<0.001
Boron	0.003	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	0.003	Iodine	0.002	Praseodymium	0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.1
Cerium	0.002	Iron	>5	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.005	Lanthanum	0.003	Rubidium	0.05	Uranium	0.01
Chlorine	0.5	Lead	0.03	Ruthenium	<0.001	Vanadium	0.003
Chromium	0.02	Lithium	0.4	Samarium	<0.001	Ytterbium	<0.001
Cobalt	*0.1	Lutetium	<0.001	Scandium	0.002	Yttrium	0.001
Copper	0.01	Magnesium	MC	Selenium	2	Zinc	0.01
Dysprosium	<0.001	Manganese	>4	Silicon	1	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	≤0.001		
Europium	<0.001	Molybdenum	0.09	Sodium	>1		

NR-Not Reported

MC-Major Component

*Heterogeneous

**Heterogeneous-probable contamination

TABLE A16. SSMS DATA FOR SAMPLE NC 958.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈1	Neodymium	0.03	Strontium	0.5
Antimony	<0.001	Gadolinium	0.006	Nickel	0.2	Sulfur	>7
Arsenic	0.006	Gallium	0.02	Niobium	≤0.003	Tantalum	<0.001
Barium	0.06	Germanium	0.002	Osmium	<0.001	Tellurium	≤0.002
Beryllium	0.08	Gold	<0.001	Palladium	<0.001	Terbium	0.002
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.01	Holmium	0.006	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	0.002	Praseodymium	0.006	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.06
Cerium	0.07	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.001	Lanthanum	0.05	Rubidium	0.02	Uranium	<0.008
Chlorine	0.3	Lead	0.07	Ruthenium	<0.001	Vanadium	0.009
Chromium	0.05	Lithium	0.07	Samarium	0.02	Ytterbium	<0.001
Cobalt	0.09	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.09
Copper	0.04	Magnesium	MC	Selenium	0.007	Zinc	0.8
Dysprosium	0.01	Manganese	MC	Silicon	3	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	0.003	Molybdenum	0.01	Sodium	>3		

NR-Not Reported

MC-Major Component

TABLE A17. SSMS DATA FOR SAMPLE NC 964.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈1	Neodymium	<0.001	Strontium	2
Antimony	*0.01	Gadolinium	<0.001	Nickel	INT	Sulfur	>3
Arsenic	0.02	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.02	Germanium	≤0.002	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	≤0.001	Iodine	0.004	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	0.002	Iron	0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.01	Uranium	0.01
Chlorine	2	Lead	0.01	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.002	Lithium	0.01	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	≤0.003
Copper	0.01	Magnesium	MC	Selenium	0.01	Zinc	0.01
Dysprosium	<0.001	Manganese	0.1	Silicon	1	Zirconium	0.003
Erbium	<0.001	Mercury	<0.001	Silver	0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

*Heterogeneous

TABLE A18. SSMS DATA FOR SAMPLE NC 969.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.07	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.09
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.003	Sulfur	>3
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.03	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.002	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	<0.001	Iodine	0.001	Praseodymium	<0.001	Tin	≤0.001
Calcium	5	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	0.001	Iron	0.04	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	<0.001	Uranium	0.005
Chlorine	0.3	Lead	0.003	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	0.001	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	5	Selenium	≤0.001	Zinc	≤0.01
Dysprosium	<0.001	Manganese	0.001	Silicon	0.1	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.04	Sodium	>1		

NR-Not Reported

MC-Major Component

Sample was thermally ashed at 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

TABLE A19. SSMS DATA FOR SAMPLE NC 979.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.2	Fluorine	MC	Neodymium	0.4	Strontium	0.7
Antimony	<0.001	Gadolinium	0.05	Nickel	2	Sulfur	>1
Arsenic	≤0.001	Gallium	0.01	Niobium	<0.001	Tantalum	<0.001
Barium	0.4	Germanium	≤0.004	Osmium	<0.001	Tellurium	≤0.001
Beryllium	0.02	Gold	<0.001	Palladium	<0.001	Terbium	0.02
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.4	Thallium	<0.001
Boron	0.01	Holmium	0.05	Platinum	<0.001	Thorium	0.007
Bromine	0.04	Indium	STD	Potassium	>2	Thulium	0.003
Cadmium	0.01	Iodine	0.008	Praseodymium	0.1	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.04
Cerium	0.7	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.7	Rubidium	0.04	Uranium	0.1
Chlorine	0.6	Lead	0.007	Ruthenium	<0.001	Vanadium	0.01
Chromium	0.1	Lithium	>0.5	Samarium	0.1	Ytterbium	0.02
Cobalt	1	Lutetium	0.004	Scandium	0.004	Yttrium	1
Copper	0.1	Magnesium	MC	Selenium	≤0.01	Zinc	MC
Dysprosium	0.08	Manganese	>2	Silicon	MC	Zirconium	0.004
Erbium	0.03	Mercury	NR	Silver	<0.001		
Europium	0.02	Molybdenum	0.01	Sodium	>0.4		

NR-Not Reported

MC-Major Component

TABLE A20. SSMS DATA FOR SAMPLE NC 1028.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈1	Neodymium	<0.001	Strontium	0.2
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>3
Arsenic	0.005	Gallium	≤0.004	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.1	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	>7	Thulium	<0.001
Cadmium	<0.001	Iodine	0.01	Praseodymium	0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	0.001	Iron	0.01	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.002	Uranium	0.02
Chlorine	MC	Lead	0.004	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.002	Lithium	0.03	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.004
Copper	0.01	Magnesium	MC	Selenium	0.001	Zinc	0.04
Dysprosium	<0.001	Manganese	0.01	Silicon	1	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A21. SSMS DATA FOR SAMPLE PN 1119.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈0.5	Neodymium	<0.001	Strontium	0.2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.03	Sulfur	>6
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	0.002	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.004	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.004	Rubidium	0.002	Uranium	0.01
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.005	Lithium	0.01	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.01	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.01	Magnesium	MC	Selenium	0.003	Zinc	0.06
Dysprosium	<0.001	Manganese	1	Silicon	4	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.04	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE A22. SSMS DATA FOR SAMPLE PN 1134.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.4	Fluorine	≈0.3	Neodymium	<0.001	Strontium	0.1
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.04	Sulfur	>2
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	<0.001	Iodine	0.001	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.04
Cerium	0.002	Iron	0.1	Rhodium	<0.001	Tungsten	*0.01
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.003	Uranium	0.01
Chlorine	*0.5	Lead	0.003	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.003	Lithium	0.004	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.01	Lutetium	<0.001	Scandium	<0.001	Yttrium	≤0.001
Copper	0.02	Magnesium	MC	Selenium	≤0.001	Zinc	0.03
Dysprosium	<0.001	Manganese	0.4	Silicon	3	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.04	Sodium	>1		

NR-Not Reported INT-Interference

MC-Major Component *Heterogeneous

Sample was thermally ashed at 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

TABLE A23. SSMS DATA FOR SAMPLE NC 1228.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.3	Neodymium	<0.001	Strontium	0.5
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>5
Arsenic	0.001	Gallium	0.001	Niobium	0.001	Tantalum	<0.001
Barium	0.4	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.3	Thallium	<0.001
Boron	0.002	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	0.002	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.04
Cerium	0.002	Iron	1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.01	Uranium	≤0.01
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.003
Chromium	0.004	Lithium	0.003	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.01	Magnesium	MC	Selenium	0.01	Zinc	0.02
Dysprosium	<0.001	Manganese	2	Silicon	1	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.04	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE A24. SSMS DATA FOR SAMPLE NC 1229.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈0.3	Neodymium	<0.001	Strontium	0.5
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.003	Sulfur	>2
Arsenic	0.001	Gallium	<0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.002	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	0.001	Iodine	0.004	Praseodymium	<0.001	Tin	0.003
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.02
Cerium	0.002	Iron	0.7	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.01	Uranium	0.01
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.003
Chromium	0.004	Lithium	0.002	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.003	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.001
Copper	0.01	Magnesium	MC	Selenium	≤0.002	Zinc	0.1
Dysprosium	<0.001	Manganese	1	Silicon	8	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.04	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A25. SSMS DATA FOR SAMPLE NC 1434.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.01
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	0.02
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.02	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	<0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.001	Indium	STD	Potassium	1	Thulium	<0.001
Cadmium	<0.001	Iodine	0.001	Praseodymium	<0.001	Tin	0.003
Calcium	0.5	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	<0.001	Iron	0.06	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	<0.001	Uranium	≤0.003
Chlorine	0.01	Lead	0.002	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	0.001	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	0.1	Selenium	0.001	Zinc	0.01
Dysprosium	<0.001	Manganese	0.004	Silicon	0.1	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	0.3		

NR-Not Reported

MC-Major Component

TABLE A26. SSMS DATA FOR SAMPLE NC 1444

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈0.4	Neodymium	<0.001	Strontium	2
Antimony	≤0.001	Gadolinium	<0.001	Nickel	0.02	Sulfur	>3
Arsenic	<0.001	Gallium	≤0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.02	Germanium	≤0.001	Osmium	<0.001	Tellurium	≤0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.004	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	≤0.001	Iodine	0.002	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.005
Cerium	<0.001	Iron	0.7	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	<0.001
Chlorine	0.006	Lead	0.007	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.002	Lithium	0.2	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.01	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.005	Magnesium	MC	Selenium	≤0.005	Zinc	0.05
Dysprosium	<0.001	Manganese	>4	Silicon	0.3	Zirconium	≤0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.05	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A27. SSMS DATA FOR SAMPLE NC 1503

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.01
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	0.1
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.02	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	2	Thulium	<0.001
Cadmium	<0.001	Iodine	0.003	Praseodymium	<0.001	Tin	<0.001
Calcium	1	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	0.001	Iron	0.04	Rhodium	<0.001	Tungsten	0.002
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.001	Uranium	0.01
Chlorine	0.02	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.003	Lithium	<0.001	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	0.1	Selenium	<0.001	Zinc	0.02
Dysprosium	<0.001	Manganese	0.004	Silicon	0.1	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.1	Sodium	0.4		

NR-Not Reported

MC-Major Component

TABLE A28. SSMS DATA FOR SAMPLE NC 1530

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.8	Neodymium	<0.001	Strontium	1
Antimony	≤0.001	Gadolinium	<0.001	Nickel	0.004	Sulfur	>3
Arsenic	0.01	Gallium	<0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.4	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>7	Thulium	<0.001
Cadmium	0.001	Iodine	0.001	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.001	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.01	Uranium	≤0.004
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	>2	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.003	Lutetium	<0.001	Scandium	0.001	Yttrium	0.001
Copper	0.03	Magnesium	MC	Selenium	0.001	Zinc	0.01
Dysprosium	<0.001	Manganese	2	Silicon	2	Zirconium	0.004
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.06	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A29. SSMS DATA FOR SAMPLE NC 1551

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈0.6	Neodymium	<0.001	Strontium	0.04
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.005	Sulfur	>7
Arsenic	0.001	Gallium	0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.06	Germanium	0.001	Osmium	<0.001	Tellurium	≤0.002
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.05	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.007	Indium	STD	Potassium	2	Thulium	<0.001
Cadmium	<0.001	Iodine	0.002	Praseodymium	<0.001	Tin	<0.001
Calcium	8	Iridium	<0.001	Rhenium	<0.001	Titanium	0.05
Cerium	≤0.002	Iron	0.3	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	<0.001
Chlorine	0.03	Lead	0.005	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.005	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.02	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.001
Copper	0.01	Magnesium	2	Selenium	0.002	Zinc	0.02
Dysprosium	<0.001	Manganese	0.06	Silicon	1	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>3		

NR-Not Reported

MC-Major Component

TABLE A30. SSMS DATA FOR SAMPLE NC 1634

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≈0.9	Neodymium	<0.001	Strontium	4
Antimony	0.002	Gadolinium	<0.001	Nickel	INT	Sulfur	>6
Arsenic	0.03	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	3	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.06	Thallium	<0.001
Boron	0.008	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	1	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.007	Iodine	0.02	Praseodymium	≤0.002	Tin	0.009
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.02
Cerium	0.003	Iron	0.6	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.007	Lanthanum	≤0.02	Rubidium	0.02	Uranium	<0.001
Chlorine	MC	Lead	≤0.008	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.01	Lithium	0.5	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.01	Magnesium	MC	Selenium	≤0.006	Zinc	0.07
Dysprosium	<0.001	Manganese	0.05	Silicon	3	Zirconium	≤0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.04	Sodium	>3		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A31. SSMS DATA FOR SAMPLE NC 1716

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈5	Neodymium	<0.001	Strontium	0.1
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>4
Arsenic	0.004	Gallium	<0.001	Niobium	0.01	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	1	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	>9	Thulium	<0.001
Cadmium	<0.001	Iodine	0.003	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.1
Cerium	0.003	Iron	0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.005	Uranium	0.01
Chlorine	3	Lead	0.004	Ruthenium	<0.001	Vanadium	0.004
Chromium	0.01	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.01	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.02	Magnesium	6	Selenium	0.003	Zinc	0.05
Dysprosium	<0.001	Manganese	0.1	Silicon	MC	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	0.001		
Europium	<0.001	Molybdenum	0.2	Sodium	>2		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A32. SSMS DATA FOR SAMPLE NC 1727

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.4	Fluorine	≈3	Neodymium	<0.001	Strontium	0.04
Antimony	<0.001	Gadolinium	<0.001	Nickel	<0.001 INT	Sulfur	>3
Arsenic	≤0.002	Gallium	<0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.04	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	<0.001 STD	Potassium	>5	Thulium	<0.001
Cadmium	<0.001	Iodine	0.004	Praseodymium	0.005	Tin	*0.002
Calcium	<0.001 MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.001	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.001	Uranium	0.01
Chlorine	2	Lead	0.003	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.002	Lithium	0.04	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	0.001	Zinc	0.01
Dysprosium	<0.001	Manganese	0.005	Silicon	5	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.05	Sodium	>1		

NR-Not Reported
MC-Major Component
*Heterogeneous

Sample was ashed at 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

TABLE A33. SSMS DATA FOR SAMPLE NC 1827

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.2	Neodymium	<0.001	Strontium	0.002
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.005	Sulfur	0.03
Arsenic	≤0.001	Gallium	≤0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.01	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	<0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.003	Indium	STD	Potassium	1	Thulium	<0.001
Cadmium	<0.001	Iodine	0.003	Praseodymium	<0.001	Tin	<0.001
Calcium	0.3	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	<0.001	Iron	*1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	<0.001	Uranium	0.005
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	<0.001	Samarium	<0.001	Ytterbium	<0.001
Cobalt	*0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.003	Magnesium	0.1	Selenium	0.001	Zinc	*0.01
Dysprosium	<0.001	Manganese	*0.01	Silicon	0.2	Zirconium	0.01
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.1	Sodium	0.5		

*Heterogeneous

NR-Not Reported

MC-Major Component

TABLE A34. SSMS DATA FOR SAMPLE NC 1849

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈2	Neodymium	<0.001	Strontium	3
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>5
Arsenic	≤0.003	Gallium	0.001	Niobium	≤0.01	Tantalum	<0.001
Barium	0.03	Germanium	0.004	Osmium	<0.001	Tellurium	≤0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.01	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	>10	Thulium	<0.001
Cadmium	<0.001	Iodine	0.004	Praseodymium	0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.02
Cerium	0.002	Iron	0.08	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.001	Lanthanum	0.002	Rubidium	0.007	Uranium	<0.001
Chlorine	MC	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.04	Lithium	0.03	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.01
Copper	0.01	Magnesium	MC	Selenium	0.005	Zinc	0.05
Dysprosium	<0.001	Manganese	0.02	Silicon	2	Zirconium	0.004
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	<0.001	Sodium	>2		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A35. SSMS DATA FOR SAMPLE NC 1921

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈0.2	Neodymium	<0.001	Strontium	3
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.002	Sulfur	>1
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.01	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.01	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	0.004
Bromine	0.1	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	≤0.001	Iodine	0.001	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.001	Iron	0.8	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.002	Uranium	<0.001
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	0.001	Zinc	0.04
Dysprosium	<0.001	Manganese	1	Silicon	5	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE A36. SSMS DATA FOR SAMPLE NC 2028

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.02
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.02	Sulfur	0.1
Arsenic	0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	≤0.002
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.002	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	1	Thulium	<0.001
Cadmium	≤0.002	Iodine	0.002	Praseodymium	<0.001	Tin	0.01
Calcium	1	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	0.002	Iron	0.1	Rhodium	<0.001	Tungsten	0.01
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.003	Uranium	0.01
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.01	Lithium	0.001	Samarium	<0.001	Ytterbium	0.001
Cobalt	0.02	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.001
Copper	0.02	Magnesium	0.2	Selenium	0.001	Zinc	0.05
Dysprosium	<0.001	Manganese	0.02	Silicon	0.3	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	≤0.001		
Europium	<0.001	Molybdenum	0.05	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE A37. SSMS DATA FOR SAMPLE NC 20214

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈4	Neodymium	<0.001	Strontium	9
Antimony	0.001	Gadolinium	<0.001	Nickel	0.005	Sulfur	>2
Arsenic	0.002	Gallium	≤0.002	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.01	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	0.001	Iodine	0.001	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	0.001	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.001	Lanthanum	0.001	Rubidium	0.01	Uranium	0.004
Chlorine	0.04	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.01	Lithium	1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.004	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.001
Copper	0.01	Magnesium	MC	Selenium	≤0.02	Zinc	0.04
Dysprosium	<0.001	Manganese	>3	Silicon	1	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>0.7		

NR-Not Reported

MC-Major Component

TABLE A38. SSMS DATA FOR SAMPLE NC 2103

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.1
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>3
Arsenic	0.001	Gallium	0.004	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>7	Thulium	<0.001
Cadmium	<0.001	Iodine	0.01	Praseodymium	0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.1
Cerium	0.001	Iron	0.1	Rhodium	<0.001	Tungsten	0.003
Cesium	0.001	Lanthanum	0.002	Rubidium	0.002	Uranium	0.4
Chlorine	MC	Lead	0.01	Ruthenium	<0.001	Vanadium	0.004
Chromium	0.02	Lithium	0.001	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	6	Selenium	≤0.001	Zinc	0.01
Dysprosium	<0.001	Manganese	0.01	Silicon	5	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.1	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE A39. SSMS DATA FOR SAMPLE NC 2218

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.5	Fluorine	≃1	Neodymium	<0.001	Strontium	0.7
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.005	Sulfur	>3
Arsenic	≤0.002	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.002	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>6	Thulium	<0.001
Cadmium	0.001	Iodine	0.004	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.02
Cerium	0.001	Iron	0.1	Rhodium	<0.001	Tungsten	0.003
Cesium	<0.001	Lanthanum	0.002	Rubidium	<0.001	Uranium	0.01
Chlorine	2	Lead	0.01	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.001	Lithium	0.003	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.04	Magnesium	MC	Selenium	0.001	Zinc	0.1
Dysprosium	<0.001	Manganese	0.05	Silicon	3	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	0.005		
Europium	<0.001	Molybdenum	0.02	Sodium	>1		

NR-Not Reported
MC-Major Component

Sample was thermally ashed at 350°C for one hour in a laboratory furnace in quartz crucible prior to analysis.

TABLE A40. SSMS DATA FOR SAMPLE NC 2238

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≈3	Neodymium	<0.001	Strontium	1
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>5
Arsenic	≤0.004	Gallium	0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.4	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.004	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.02
Cerium	<0.001	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.001	Uranium	<0.001
Chlorine	MC	Lead	0.004	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.01	Lithium	0.03	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.01
Copper	0.01	Magnesium	MC	Selenium	≤0.02	Zinc	0.01
Dysprosium	<0.001	Manganese	0.001	Silicon	1	Zirconium	0.004
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>2		

NR-Not Reported

MC-Major Component

INT-Interference

Table A41. SAMPLE NC 104 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	methylene chloride	8000
0.18	chloroform	∿12
0.26	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	∿5
0.40	benzene	∿5
0.61	1,1,2,2-tetrachloroethene	∿24
0.62	C_8 alkane (tentative)	NQ
0.67	toluene	∿1
0.79	ethylbenzene	<1
0.84	column bleed	
0.91	*m* and/or *p* xylene	∿1
0.92	*o*-xylene	∿1
1.00	2-CHLOROETHYLBENZENE	IS
1.02	ethyltoluene	<1

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A42. SAMPLE NC 503 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	2500
0.11	trichlorofluoromethane	∿31
0.18	chloroform	7
0.26	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	<1
0.40	benzene	1
0.46	unknown	
0.63	C_8 alkane (tentative)	NQ
0.67	toluene	5
0.68	unknown	
0.84	column bleed	
0.90	*m* and/or *p*-xylene	<1
0.92	*o*-xylene	<1
1.00	2-CHLOROETHYLBENZENE	IS
1.04	septum bleed	
1.08	unknown	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A43. SAMPLE NC 516 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	3
0.24	chloroform	5
0.26	1,2-dichloroethane	<1
0.32	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	17
0.45	benzene	<1
0.52	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethane	1
0.66	2,2-dimethylhexane	6
0.70	toluene	<1
0.85	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylene.

TABLE A44. Sample NC 526 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	430
0.13	carbon disulfide	computer failure
0.23	chloroform	blank contaminant
0.27	trimethylsilanol (tentative)	NQ
0.35	unknown	
0.53	C_6H_{14} isomer (tentatiave)	NQ
0.60	unknown	
0.67	unknown	
0.71	toluene	blank contaminant
0.75	2-n-butoxyethanol (tentative)	NQ
0.81	$C_4H_7ClO_2$ isomer (tentative)	NQ
0.84	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A45. SAMPLE T513 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
0.50*	methylene chloride	∿2300
1.27	chloroform	18
1.30	cis 1,2-dichloroethylene	1
1.40	unknown	
1.60	1,1,1-trichloroethane	2
1.67	trimethysilanol (tentative)	NQ
1.91	methylcyclopentane	∿40
2.42	benzene	12
2.72	n-hexane (tentative)	NQ
3.18	unknown	
3.42	1,1,2,2-tetrachloroethene	5
3.50	C_8H_{18} isomer (tentative)	NQ
3.72	toluene	5
4.27	ethylbenzene	<1

*An internal standard was not added. Quantifications were based on the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE A46. FIELD BLANK T511 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.08	methylene chloride	16000
	trichlorofluoromethane	14
0.18	chloroform	16
	1,2-dichloroethylene	1
0.20	unknown	
0.25	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	17
0.41	benzene	20
0.61	1,1,2,2-tetrachloroethene	29
0.63	C_8H_{18} isomer (tentative)	NQ
0.67	toluene	7
0.84	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.03	column bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A47. SAMPLE V6 01 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.01	methylene chloride	∿47
0.02	trichlorofluoromethane	∿25
0.11	chloroform	10
0.14	1,2-dichloroethane	1
0.20	trimethylsilanol (tentative)	NQ
0.36	benzene	<1
0.57	1,1,2,2-tetrachloroethene	5
0.63	unknown	
0.66	toluene	<1
0.83	unknown	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A48. FIELD BLANK V625 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	methylene chloride	∿1700
0.09	carbon disulfide	blank contaminant
0.11	trichlorofluoromethane	∿33
0.18	chloroform	10
0.21	1,2-dichloroethane	<1
0.26	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	∿1
0.40	benzene	2
0.61	1,1,2,2-tetrachloroethene	10
0.62	C_8 alkane (tentative)	NQ
0.67	toluene	5
0.68	unknown	
0.77	3-heptanone (tentative)	NQ
0.78	ethylbenzene	<1
0.84	column bleed	
0.91	*m* and/or *p*-xylene	<1
0.92	*o*-xylene	<1
1.00	2-CHLOROETHYLBENZENE	IS
1.04	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A49. SAMPLE V6 13 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	300
0.12	noise spike	
0.14	chloroform	2
0.23	trimethylsilanol (tentative)	NQ
0.28	methylcyclopentane	4
0.38	benzene	<1
0.60	1,1,2,2-tetrachloroethene	16
0.66	toluene	<1
0.78	ethylbenzene	<1
0.84	column bleed	
0.90	xylene isomer	∿2
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A50. SAMPLE NC 715 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	150
0.24	chloroform	7
0.32	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	∿3
0.46	benzene	<1
0.64	1,1,2,2-tetrachloroethene	1
0.65	unknown	
0.70	unknown	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A51. SAMPLE NC 726 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	∿170
0.25	chloroform	blank contaminant
0.33	trimethylsilanol (tentative)	NQ
0.58	unknown	
0.75	toluene	blank contaminant
0.82	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A52. SAMPLE V705 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	methylene chloride	1700
0.11	unknown mixture (dimethylamine & unknown) (tentative)	NQ
0.17	chloroform	∿10
0.21	1,2-dichloroethane	∿1
0.26	trimethylsilanol (tentative)	NQ
0.40	benzene	∿4
0.46	n-hexane	NQ
0.61	1,1,2,2-tetrachloroethene	∿11
0.62	C_8alkane (tentative)	NQ
0.67	toluene	∿4
0.75	unknown	
0.76	3-heptanone ($C_7H_{14}O$)(tentative)	NQ
0.78	ethylbenzene	<1
0.84	column bleed	
0.91	m and/or p-xylene	∿1
0.92	o-xylene	2
1.00	2-CHLOROETHYLBENZENE	IS
1.02	ethyltoluene	<1
1.04	septum bleed	
1.16	C_9H_{12}-trimethylbenzene isomer	∿3

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A53. SAMPLE NC804 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	methylene chloride	5000
0.17	chloroform	8
0.24	1,1,1-trichloroethane	1
0.32	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	∿25
0.46	benzene	<1
0.51	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethene	4
0.66	2,2-dimethylhexane	6
0.70	toluene	<1
0.79	ethylbenzene	<1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A54. SAMPLE NC 816 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.08	methylene chloride	20000
0.13	trichlorofluoromethane	14
0.19	chloroform +	18
	1,2-dichloroethylene	2
0.24	1,1,1-trichloroethane	2
0.26	trimethylsilanol (tentative)	NQ
0.31	methylcyclopentane	14
0.41	benzene	1
0.62	1,1,2,2-tetrachloroethene	14
0.64	C_8H_{18} isomer (tentative)	NQ
0.68	toluene	<1
0.74	2-n-butoxyethanol (tentative)	NQ
0.84	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-Chloroethylbenzene.

TABLE A55. SAMPLE NC826 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	methylene chloride	7500
0.18	chloroform	19
0.19	1,2-dichloroethylene	1
0.25	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	
0.40	benzene	16
0.47	n-hexane	
0.61	1,1,2,2-tetrachloroethene	81
0.68	toluene	22
0.79	ethylbenzene	1
0.84	computer failure	
1.00	2-CHLOROETHYLBENZENE	IS
1.03	computer failure	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A56. SAMPLE NC914 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	methylene chloride	6700
0.09	trichlorofluoromethane	∿37
0.17	chloroform	42
0.21	1,2-dichloroethane	2
0.26	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	∿1
0.40	benzene	6
0.46	n-hexane (tentative)	NQ
0.61	1,1,2,2-tetrachloroethene	31
0.63	C_8alkane (tentative)	NQ
0.67	toluene	5
0.68	unknown	
0.77	3-heptanone ($C_7H_{14}O$) (tentative)	NQ
0.79	ethylbenzene	<1
0.84	column bleed	
0.90	styrene (tentative)	<1
0.91	*m* and/or *p*-xylene	∿2
0.93	*o*-xylene	1
1.00	2-CHLOROETHYLBENZENE	IS
1.02	ethyltoluene	<1
1.05	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A57. SAMPLE NC917 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	4100
0.18	chloroform	7
0.26	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	∿4
0.40	benzene	6
0.46	n-hexane (tentative)	NQ
0.61	1,1,2,2-tetrachloroethene	5
0.62	C_8 alkane (tentative)	NQ
0.67	toluene	2
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A58. SAMPLE NC920 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	methylene chloride	13000
0.14	trichlorofluoromethane	14
0.19	chloroform	14
0.20	1,2-dichloroethylene	1
0.25	1,1,1-trichloroethane	2
0.26	trimethylsilanol (tentative)	NQ
0.31	methylcyclopentane	20
0.41	benzene	2
0.47	n-hexane (tentative)	NQ
0.64	2,2-dimethylhexane	14
0.67	toluene	<1
0.74	2-n-butoxyethanol (tentative)	NQ
0.84	column bleed + unknown	
1.00	2-CHLOROETHYLBENZENE	IS
1.02	column bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A59. SAMPLE NC971 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	∿4800
0.21	chloroform	10
0.28	trimethylsilanol (tentative)	NQ
0.33	methylcyclopentane	∿8
0.43	benzene	2
0.48	n-hexane (tentative)	NQ
0.64	2,2-dimethylhexane	∿5
0.70	toluene	<1
0.82	unknown	
0.85	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A60. SAMPLE NC1004 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	14000
0.21	chloroform	12
0.22	1,2-dichloroethylene	2
0.27	1,1,1-trichloroethane	1
0.27	trimethylsilanol (tentative)	NQ
0.33	methylcyclopentane	20
0.35	unknown	
0.43	benzene	blank contaminant
0.48	n-hexane (tentative)	NQ
0.54	unknown	
0.64	2,2-dimethylhexane	14
0.70	unknown	
0.74	2-n-butoxyethanol (tentative)	NQ
0.84	unknown	
0.85	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A61. SAMPLE PN1105 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	6900
0.16	chloroform	11
0.17	cis 1,2-dichloroethylene	1
0.23	1,1,1-trichloroethane	2
0.32	trimethylsilanol (tentative)	NQ
0.35	methylcyclopentane	∿61
0.46	benzene	5
0.51	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethene	<1
0.70	toluene	1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A62. SAMPLE PN1126 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	methylene chloride	∿4200
0.20	chloroform	11
0.21	cis 1,2-dichloroethylene	1
0.27	1,1,1-trichloroethane	2
0.28	trimethylsilanol (tentative)	NQ
0.33	methylcyclopentane	∿8
0.48	n-hexane (tentative)	NQ
0.63	2,2-dimethylhexane	4
0.67	unknown	
0.81	unknown	
0.84	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A63. SAMPLE NC125-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	methylene chloride	8100
0.10	trichlorofluoromethane	33
0.18	chloroform	12
0.25	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	9
0.41	benzene	<1
0.47	n-hexane (tentative)	NQ
0.61	1,1,2,2-tetrachloroethene	9
0.63	silicone compound (tentative)	NQ
0.66	unknown	
0.73	2-n-butoxyethanol (tentative)	NQ
0.84	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.02	septum bleed	
1.18	benzothiazole ($C_7H_{14}NS$) (tentative)	NQ

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A64. SAMPLE NC125-2 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
0.18*	methylene chloride	∿10000
0.87	chloroform	7
1.28	trimethylsilanol (tentative)	NQ
1.50	methylcyclopentane	2
2.02	benzene	2
2.32	n-hexane (tentative)	NQ
3.11	C_8 alkane	
3.34	unknown	
4.18	column bleed	

*An internal standard was not added. Quantifications were based on the standard runs. Rather than identifying the compounds' retention times relative to the internal standards, the scan numbers at which the compounds eluted have been noted.

TABLE A65. SAMPLE NC126-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.01	ethanol (tentative)	~NQ
0.04	methylene chloride	8400
0.09	trichlorofluoromethane	~32
0.18	chloroform	~12
0.21	1,2-dichloroethane	~2
0.25	unknown	
0.26	trimethylsilanol (tentative)	NQ
0.40	benzene	blank contaminant
0.61	1,1,2,2-tetrachloroethene	~83
1.00	2-CHLOROETHYLBENZENE	IS
1.05	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A66. SAMPLE NC126-2 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	3700
0.21	chloroform	4
0.27	trimethylsilanol (tentative)	NQ
0.33	methylcyclopentane	5
0.42	benzene	1
0.48	n-hexane (tentative)	NQ
0.53	unknown	
0.64	C_8H_{18} isomer (tentative)	NQ
0.68	toluene	4
0.74	2-butoxyethanol (tentative)	NQ
0.80	ethylbenzene	<1
0.83	unknown	
0.85	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.07	1,2,3-thiadizole (C_2H_2NS) (tentative)	NQ

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A67. FIELD BLANK NC1203 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	methylene chloride	∿7000
0.09	trichlorofluoromethane	∿23
0.18	chloroform	∿11
0.19	1,2-dichloroethane	∿1
0.26	trimethylsilanol (tentative)	NQ
0.29	methylcyclopentane	∿1
0.40	benzene	∿2
0.61	1,1,2,2-tetrachloroethene	∿8
0.63	toluene	∿3
0.67	unknown	
0.77	3-heptanone (tentative)	NQ
0.85	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.04	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A68. SAMPLE NC1437 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	3300
0.29	chloroform	17
0.31	cis(1,2)dichloroethylene	2
0.37	1,1,1-trichloroethane	2
0.39	trimethylsilanol (tentative)	NQ
0.43	methylcyclopentane	52
0.56	benzene	<1
0.63	n-hexane (tentative)	NQ
0.81	C_8H_{18} isomer (tentative)	NQ
0.86	toluene	<1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A69. SAMPLE NC1508 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	ethanol (tentative)	NQ
0.04	methylene chloride	23000
0.19	chloroform	10
0.27	trimethylsilanol (tentative)	NQ
0.61	1,1,2,2-tetrachloroethene	50
0.79	ethylbenzene	1
0.91	_m_ and/or _p_-xylene	1
0.92	o-xylene	2
1.00	2-CHLOROETHYLBENZENE	IS
1.02	1,3-butanediol ($C_4H_{10}O_2$) (tentative)	NQ
1.04	column	
1.16	unknown	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A70. SAMPLE NC1509 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	11000
0.13	trichlorofluoromethane	∿13
0.17	chloroform	21
0.18	1,2-dichloroethylene	2
0.24	1,1,1-trichloroethane	2
0.25	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	10
0.41	benzene	14
0.61	1,1,2,2-tetrachloroethene	<1
0.62	2,2-dimethylhexane (tentative)	NQ
0.67	toluene	10
0.78	ethylbenzene	<1
0.83	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.02	column bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A71. SAMPLE NC1544 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	methylene chloride	66000
0.14	trichlorofluoromethane	22
0.18	chloroform	19
0.20	1,2-dichloroethylene	2
0.22	1,1,1-trichloroethane	2
0.25	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	42
0.34	C_6 alkane (tentative)	NQ
0.38	unknown	16
0.41	benzene	17
0.57	tetrachloroethylene	1
0.61	silicone compound (tentative)	NQ
0.64	toluene	2
0.68	unknown	
0.73	n-butoxyethanol (tentative)	NQ
0.80	ethylbenzene	<1
0.84	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.02	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A72. SAMPLE NC1626 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	7000
0.22	chloroform	2
0.28	trimethylsilanol (tentative)	NQ
0.32	methylcyclopentane	2
0.53	unknown	
0.64	unknown	
0.67	unknown	
0.74	2-n-butoxyethanol (tentative)	NQ
0.82	column bleed	
0.83	unknown	
0.84	unknown	
1.00	2-CHLOROETHYLBENZENE	IS
1.07	1,2,3-thiadizole (tentative)	NQ
1.11	unknown	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A73. FIELD BLANK NC1603 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	23000
0.17	chloroform	16
0.18	1,2-dichloroethylene	1
0.22	1,1,1-trichloroethane	1
0.25	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	20
0.40	benzene	17
0.46	n-hexane (tentative)	NQ
0.60	1,1,2,2-tetrachloroethene	24
0.61	2,2-dimethylhexane (tentative)	18
0.66	toluene	6
0.71	2-n-butoxyethanol (tentative)	NQ
0.78	ethylbenzene	<1
0.80	column bleed	
0.97	unknown	
1.00	2-CHLOROETHYLBENZENE	IS
1.15	benzothiazole (tentative)	NQ

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A74. SAMPLE NC1708 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	6000
0.17	chloroform	10
0.18	1,2-dichloroethylene	1
0.24	1,2-dichloroethane	<1
0.28	1,1,1-trichloroethane	1
0.32	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	27
0.43	benzene	<1
0.51	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethene	1
0.66	toluene	blank contaminant
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A75. SAMPLE NC1719 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.08	methylene chloride	20000
0.15	chloroform	21
0.18	1,2-dichloroethylene	3
0.23	1,1,1-trichloroethane	2
0.25	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	∿4
0.40	benzene	1
0.61	1,1,2,2-tetrachloroethene	20
0.63	2,2-dimethylhexane (tentative)	NQ
0.67	toluene	<1
0.73	2-butoxyethanol (tentative)	NQ
0.84	unknown	
1.00	2-CHLOROETHYLBENZENE	IS
1.03	column bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A76. SAMPLE NC1802 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	methylene chloride	2700
0.23	chloroform	13
0.24	cis 1,2-dichloroethylene	1
0.32	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	40
0.45	benzene	6
0.51	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethene	1
0.70	toluene	2
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A77. SAMPLE NC1936 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	3600
0.25	chloroform	16
0.30	air peak	
0.33	trimethylsilanol (tentative)	NQ
0.38	methylcyclopentane	39
0.47	benzene	2
0.52	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethene	4
0.67	2,2-dimethylhexane	20
0.70	toluene	<1
0.86	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A78. SAMPLE NC2021 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	5000
0.22	chloroform	7
0.25	cis 1,2-dichloroethylene	2
0.30	1,1,1-trichloroethane	1
0.32	trimethylsilanol (tentative)	NQ
0.37	methylcyclopentane	57
0.47	benzene	7
0.52	n-hexane (tentative)	NQ
0.66	1,1,2,2-tetrachloroethene	2
0.71	toluene	2
0.86	ethylbenzene	<1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A79. SAMPLE NC2117 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	1200
0.25	chloroform	7
0.32	trimethylsilanol (tentative)	NQ
0.36	methylcyclopentane	21
0.46	benzene	2
0.51	n-hexane (tentative)	NQ
0.65	1,1,2,2-tetrachloroethene	blank contaminant
0.66	C_8H_{18} isomer	7
0.71	toluene	4.2
0.79	ethylbenzene	<1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A80. FIELD BLANK NC2115 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	methylene chloride	4500
0.09	trichlorofluoromethane	∿50
0.18	chloroform	8
0.23	1,2-dichloroethane	<1
0.28	trimethylsilanol (tentative)	NQ
0.32	methylcyclopentane	∿1
0.41	benzene	3
0.48	n-hexane (tentative)	NQ
0.62	1,1,2,2-tetrachloroethene	8
0.63	C_8 alkane (tentative)	NQ
0.67	toluene	5
0.71	unknown	
0.77	3-heptanone (tentative)	NQ
0.83	ethylbenzene	<1
0.87	column bleed	
0.92	_m_ and/or _p_-xylene	<1
0.96	_o_-xylene	<1
1.00	2-CHLOROETHYLBENZENE	IS
1.07	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A81. SAMPLE NC2209 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.09	methylene chloride	1800
0.21	chloroform	blank contaminant
0.23	unknown	
0.27	trimethylsilanol (tentative)	NQ
0.33	methylcyclopentane	2
0.43	benzene	blank contaminant
0.48	n-hexane (tentative)	NQ
0.52	unknown	
0.68	unknown	
0.69	toluene	blank contaminant
0.74	2-n-butoxyethanol (tentative)	NQ
0.81	unknown	
0.83	column bleed	
1.00	2-CHLOROETHYLBENZENE	IS
1.07	1,2,3-thiadizole (tentative)	NQ

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A82. FIELD BLANK NC2207 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	methylene chloride	5200
0.10	trichlorofluoromethane	∿25
0.18	chloroform	9
0.19	ethyl ether (tentative)	NQ
0.21	1,2-dichloroethane	<1
0.26	trimethylsilanol (tentative)	NQ
0.30	methylcyclopentane	6
0.40	benzene	9
0.46	n-hexane (tentative)	NQ
0.55	di-n-propylether	<1
0.61	1,1,2,2-tetrachloroethene	24
0.62	C_8 alkane (tentative)	NQ
0.67	toluene	5
0.68	unknown	
0.78	ethylbenzene	<1
0.84	column bleed	
0.90	m and/or p-xylene	∿1
0.93	o-xylene	8
0.95	unknown	
1.00	2-CHLOROETHYLBENZENE	IS
1.02	ethyltoluene	<1
1.04	septum bleed	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A83. SAMPLE NC2211 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	methylene chloride	71000
0.11	trichlorofluoromethane	17
0.18	chloroform	25
0.20	1,2-dichloroethylene	25
0.25	1,1,1-trichloroethane	2
0.29	trimethylsilanol (tentative)	NQ
0.31	methylcyclopentane	30
0.41	benzene	<1
0.48	unknown	
0.56	unknown	
0.63	unknown	
0.64	silicone compound (tentative)	NQ
0.67	toluene	<1
0.73	2-n-butyoxyethanol (tentative)	NQ
0.84	unknown	
1.00	2-CHLOROETHYLBENZENE	IS
1.02	septum bleed	
1.17	benzothizole (tentative)	NQ

*Relative to the internal standard 2-chloroethylbenzene.

TABLE A84. FIELD BLANKS CONTAINING NO DETECTABLE ORGANIC COMPOUNDS*

NC 101A
NC 101 B/N
NC 502A
T510 A
T510 B/N
V6 24 A
V6 24 B/N
NC 702 B/N
V702 A
NC 802 A
NC 802 B/N
NC 909 A
NC 909 B/N
NC 1001 A
NC 1902 A
PN-1101 A
PN-1101 B/N
NC 1201 A
NC 1201 B/N
NC 1402 B/N
NC 1501 A
NC 1501 B/N
NC 1505 A
NC 1505 B/N
NC 1602 A
NC 1706 A
NC 1706 B/N
NC 1858 B/N
NC 20-2-7 A
NC 2206 A
NC 2206 B/N

TABLE A85. SAMPLE NC 107 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.22	bis(2-ethylhexyl)phthalate	980

*Relative to the internal standard d-10 Anthracene.

TABLE A86. SAMPLE NC 107 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butyl phthalate	540
1.26	bis(2-ethylhexyl)phthalate	490

*Relative to the internal standard D-10 Anthracene.

TABLE A87. SAMPLE NC 507 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard d-10 Anthracene.

TABLE A88. SAMPLE NC 507 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.92	unknown	
0.96	unknown	
1.00	D-10 ANTHRACENE	IS
1.42	bis(2-ethylhexyl)phthalate	520

*Relative to the internal standard d-10 Anthracene.

TABLE A89. FIELD BLANK NC 502 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.42	column bleed	
0.48	1-(2-butoxyethoxy)ethanol	∿95000
0.65	2-butoxyethanol	21000
0.72	column bleed	
0.83	column bleed	
0.94	column bleed	
1.00	D-10 ANTHRACENE	IS
1.05	column bleed	
1.14	unknown	
1.23	column bleed	
1.28	column bleed	
1.36	column bleed	
1.44	column bleed	
1.52	column bleed	
1.59	column bleed	

*Relative to the internal standard d-10 Anthracene.

TABLE A90. SAMPLE NC 518 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.43	bis(2-ethylhexyl)phthalate	200

*Relative to the internal standard d-10 Anthracene.

TABLE A91. SAMPLE NC 529 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	unknown	
0.86	unknown	
1.00	D-10 ANTHRACENE	IS
1.22	bis(2-ethylhexyl)phthalate	180

*Relative to the internal standard d-10 Anthracene.

TABLE A92. SAMPLE NC 529 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.85	unknown alkane	
1.00	D-10 ANTHRACENE	IS
1.13	unknown	
1.48	bis(2-ethylhexylphthalate)	610
1.57	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A93. SAMPLE T531 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.43	unknown	
0.54	1-(2-butoxyethoxy)ethanol	220000
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	860
1.24	bis(2-ethylhexyl)phthalate	80

*Relative to the internal standard d-10 Anthracene.

TABLE A94. SAMPLE T531 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.56	1-(2-butoxyethoxy)ethanol	∿192
0.72	unknown	
0.88	diethylphthalate	790
0.92	column bleed	
1.00	D-10 ANTHRACENE	IS
1.10	unknown phthalate	
1.17	unknown	
1.24	column bleed	
1.30	column bleed	
1.36	bis(2-ethylhexyl)phthalate	420

*Relative to the internal standard d-10 Anthracene.

TABLE A95. SAMPLE V6 05 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	250
1.17	unknown	
1.26	bis(2-ethylhexyl)phthalate	740

*Relative to the internal standard d-10 Anthracene.

TABLE A96. SAMPLE V6 05 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.11	di-n-butylphthalate	960
1.42	bis(2-ethylhexyl)phthalate	4400
1.52	$C_{10}H_{16}O$ isomer (tentative)	NQ

*Relative to the internal standard d-10 Anthracene.

TABLE A97. SAMPLE V6 16 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.01	di-n-butylphthalate	990
1.24	bis(2-ethylhexyl)phthalate	230

*Relative to the internal standard d-10 Anthracene.

TABLE A98. SAMPLE V6 16 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.88	unknown phthalate	
1.00	D-10 ANTHRACENE	IS
1.05	unknown	
1.10	di-n-butylphthalate	690
1.42	bis(2-ethylhexyl)phthalate	630

*Relative to the internal standard d-10 Anthracene.

TABLE A99. SAMPLE NC 719 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.03	di-n-butyl phthalate	210
1.18	unknown	
1.26	bis(2-ethylhexyl)phthalate	160
1.38	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A100. SAMPLE NC 719 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.88	unknown	
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.68	bis(2-ethylhexyl)phthalate	290

*Relative to the internal standard d-10 Anthracene.

TABLE A101. FIELD BLANK NC 702 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	29
1.27	bis(2-ethylhexyl)phthalate	630

*Relative to the internal standard d-10 Anthracene.

TABLE A102. SAMPLE NC 730 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.26	bis(2-ethylhexyl)phthalate	570

*Relative to the internal standard d-10 Anthracene.

TABLE A103. SAMPLE NC 730 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.91	$C_{15}H_{30}O_3$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.05	unknown phthalate	
1.43	bis(2-ethylhexyl)phthalate	300

*Relative to the internal standard d-10 Anthracene.

TABLE A104. SAMPLE V720 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.55	1-(2-butoxyethoxy)ethanol (tentative)	NQ
0.78	diethylphthalate	61
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	360
1.22	bis(2-ethylhexyl)phthalate	370

*Relative to the internal standard d-10 Anthracene.

TABLE A105. SAMPLE V720 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.63	unknown alkane	
0.94	1-(2-butoxyethoxy)ethanol	$\sim$2000
1.00	D-10 ANTHRACENE	IS
1.43	bis(2-ethylhexyl)phthalate	330

*Relative to the internal standard d-10 Anthracene.

TABLE A106. FIELD BLANK V702 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
1.00	D-10 ANTHRACENE	IS
1.07	di-n-butylphthalate	220
1.19	bis(2-ethylhexyl)phthalate	1600

*Relative to the internal standard d-10 Anthracene.

TABLE A107. SAMPLE NC 808 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.16	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A108. SAMPLE NC 808 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.88	computer failure	
0.94	computer failure	
1.00	D-10 ANTHRACENE	IS
1.53	bis(2-ethylhexyl)phthalate	1000

*Relative to the internal standard d-10 Anthracene.

TABLE A109. SAMPLE NC 819 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.20	bis(2-ethylhexyl)phthalate	140

*Relative to the internal standard d-10 Anthracene.

TABLE A110. SAMPLE NC 819 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.89	unknown	
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.11	unknown phthalate	
1.41	bis(2-ethylhexyl)phthalate	860
1.52	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A111. SAMPLE NC 830 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard d-10 Anthracene.

TABLE A112. SAMPLE NC 830 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.08	di-n-butylphthalate	240
1.39	bis(2-ethylhexyl)phthalate	89

*Relative to the internal standard d-10 Anthracene.

TABLE A113. SAMPLE NC 929 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.51	computer failure	
0.56	computer failure	
0.83	diethylphthalate	260
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	2900
1.11	computer failure	
1.22	bis(2-ethylhexyl)phthalate	5800

*Relative to the internal standard d-10 Anthracene.

TABLE A114. SAMPLE NC 929 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.65	computer failure	
0.86	diethyl phthalate	disc failure
0.92	computer failure	
0.94	computer failure	
1.00	D-10 ANTHRACENE	IS
1.03	unknown	
1.13	di-n-butylphthalate	510
1.16	unknown	
1.24	computer failure	
1.41	unknown amide	
1.49	bis(2-ethylhexyl)phthalate	470
1.73	unknown alkane	

*Relative to the internal standard d-10 Anthracene.

TABLE A115. SAMPLE NC 931 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.85	unknown	
0.88	unknown	
1.00	D-10 ANTHRACENE	IS
1.08	di-n-butylphthalate	250
1.26	bis(2-ethylhexyl)phthalate	110

*Relative to the internal standard d-10 Anthracene.

TABLE A116. SAMPLE NC 931 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.89	unknown	
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.15	di-n-butylphthalate	630
1.60	bis(2-ethylhexyl)phthalate	680

*Relative to the internal standard d-10 Anthracene.

TABLE A117. SAMPLE NC 935 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.27	bis(2-ethylhexyl)phthalate	760

*Relative to the internal standard d-10 Anthracene.

TABLE A118. SAMPLE NC 935 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.89	computer failure	
0.93	computer failure	
1.00	D-10 ANTHRACENE	IS
1.10	di-n-butylphthalate	disc failure
1.36	unknown phthalate	
1.45	bis(2-ethylhexyl)phthalate	920

*Relative to the internal standard d-10 Anthracene.

TABLE A119. SAMPLE NC 974 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.54	1-(2-butoxyethoxy)ethanol	~180000
1.00	D-10 ANTHRACENE	IS
1.23	bis(2-ethylhexyl)phthalate	180

*Relative to the internal standard d-10 Anthracene.

TABLE A120. SAMPLE NC 974 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.52	1-(2-butoxyethoxy)ethanol	200000
0.66	unknown	
1.00	D-10 ANTHRACENE	IS
1.40	bis(2-ethylhexyl)phthalate	620
1.50	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A121. FIELD BLANK NC 967 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.54	1-(2-butoxyethoxy)ethanol	~190000
1.00	D-10 ANTHRACENE	IS
1.26	bis(2-ethylhexyl)phthalate	700

*Relative to the internal standard d-10 Anthracene.

TABLE A122. FIELD BLANK NC 967 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.43	(1-2-butoxyethoxy)ethanol	~200000
0.51	unknown	
0.69	column bleed	
0.71	column bleed	
0.83	unknown	
0.95	column bleed	
1.00	D-10 ANTHRACENE	IS
1.04	column bleed	
1.13	column bleed	
1.21	column bleed	
1.30	column bleed	
1.38	unknown	
1.47	bis(2-ethylhexyl)phthalate	650

*Relative to the internal standard d-10 Anthracene.

TABLE A123. SAMPLE NC 1013 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	unknown	
0.87	unknown	
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	140
1.24	bis(2-ethylhexyl)phthalate	540

*Relative to the internal standard d-10 Anthracene.

TABLE A124. SAMPLE NC 1013 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.10	di-n-butylphthalate	560
1.58	bis(2-ethylhexyl)phthalate	380

*Relative to the internal standard d-10 Anthracene.

TABLE A125. SAMPLE PN-1111 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.86	unknown	
1.00	D-10 ANTHRACENE	IS
1.26	bis(2-ethylhexyl)phthalate	78

*Relative to the internal standard d-10 Anthracene.

TABLE A126. SAMPLE PN-1111 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
0.94	unknown	
1.00	D-10 ANTHRACENE	IS
1.36	bis(2-ethylhexyl)phthalate	190

*Relative to the internal standard d-10 Anthracene.

TABLE A127. SAMPLE PN-1130 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.31	bis(2-ethylhexyl)phthalate	260

*Relative to the internal standard d-10 Anthracene.

TABLE A128. SAMPLE PN-1130 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
1.00	D-10 ANTHRACENE	IS
1.05	unknown	
1.17	di-n-butylphthalate	270
1.27	unknown	
1.46	bis(2-ethylhexyl)phthalate	2900
1.57	computer failure	
1.78	column bleed	

*Relative to the internal standard d-10 Anthracene.

TABLE A129. SAMPLE NC 1213 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	unknown	
0.85	unknown	
0.88	unknown alkane	
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	200
1.26	bis(2-ethylhexyl)phthalate	650

*Relative to the internal standard d-10 Anthracene.

TABLE A130. SAMPLE NC 1213 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	diethylphthalate	390
0.91	unknown alkane	
1.00	D-10 ANTHRACENE	IS
1.05	unknown alkane	
1.44	bis(2-ethylhexyl)phthalate	680

*Relative to the internal standard d-10 Anthracene.

TABLE A131. SAMPLE NC 1215 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.66	noise spike	
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	40
1.28	bis(2-ethylhexyl)phthalate	180

*Relative to the internal standard d-10 Anthracene.

TABLE A132. SAMPLE NC 1215 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.46	bis(2-ethylhexyl)phthalate	920
1.59	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A133. SAMPLE NC 1440 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.53	1-(2-butoxyethoxy)ethanol	67000
0.83	diethylphthalate	18
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	260
1.23	bis(2-ethylhexyl)phthalate	980

*Relative to the internal standard d-10 Anthracene.

TABLE A134. SAMPLE NC 1440 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.62	unknown alkanes	
0.89	$C_7H_{16}O_2$ isomer	
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.09	di-n-butylphthalate	600
1.36	bis(2-ethylhexyl)phthalate	560

*Relative to the internal standard d-10 Anthracene.

TABLE A135. FIELD BLANK NC 1402 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.85	unknown	
1.00	D-10 ANTHRACENE	IS
1.03	di-n-butylphthalate	51
1.26	bis(2-ethylhexyl)phthalate	21

*Relative to the internal standard d-10 Anthracene.

TABLE A136. FIELD BLANK NC 1433 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.44	unknown	
0.51	1-(2-butoxy)ethanol	∿4000
0.56	unknown	
1.00	D-10 ANTHRACENE	IS
1.26	bis(2-ethylhexyl)phthalate	2400

*Relative to the internal standard d-10 Anthracene.

TABLE A137. FIELD BLANK NC 1433 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.42	unknown	
0.61	unknown	
1.00	D-10 ANTHRACENE	IS
1.13	unknown phthalate	
1.23	column bleed	
1.32	column bleed	
1.41	column bleed	
1.51	bis(2-ethylhexyl)phthalate	380

*Relative to the internal standard d-10 Anthracene.

TABLE A138. SAMPLE NC 1547 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.26	bis(2-ethylhexyl)phthalate	330

*Relative to the internal standard d-10 Anthracene.

TABLE A139. SAMPLE NC 1547 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.13	di-n-butylphthalate	210
1.42	bis(2-ethylhexyl)phthalate	6100
1.51	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A140. SAMPLE NC 1630 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.01	di-n-butylphthalate	100
1,28	bis(2-ethylhexyl)phthalate	54

*Relative to the internal standard d-10 Anthracene.

TABLE A141. SAMPLE NC 1630 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.42	computer failure	
0.57	computer failure	
1.00	D-10 ANTHRACENE	IS
1.44	bis(2-ethylhexyl)phthalate	1200

*Relative to the internal standard d-10 Anthracene.

TABLE A142. FIELD BLANK NC 1602 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.51	bis(2-ethylhexyl)phthalate	840

*Relative to the internal standard d-10 Anthracene.

TABLE A143. SAMPLE NC 1712 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.53	1-(2-butoxyethoxy)ethanol	62000
1.00	D-10 ANTHRACENE	IS
1.01	di-n-butylphthalate	150

*Relative to the internal standard d-10 Anthracene.

TABLE A144. SAMPLE NC 1712 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.60	1-(2-butoxyethoxy)ethanol	~46000
0.90	unknown	
0.94	unknown	
1.00	D-10 ANTHRACENE	IS
1.12	di-n-butylphthalate	420
1.36	bis(2-ethylhexyl)phthalate	170

*Relative to the internal standard d-10 Anthracene.

TABLE A145. FIELD BLANK NC 1702 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.52	1-(2-butoxyethoxy)ethanol	270000
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.24	bis(2-ethylhexyl)phthalate	1800

*Relative to the internal standard d-10 Anthracene.

TABLE A146. FIELD BLANK NC 1702 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.48	1-(2-butoxyethoxy)ethanol	80000
0.64	2-butoxyethanol	10000
1.00	D-10 ANTHRACENE	IS
1.14	di-n-butylphthalate	390
1.45	bis(2-ethylhexyl)phthalate	780
1.50	unknown phthalate	

*Relative to the internal standard d-10 Anthracene.

TABLE A147. SAMPLE NC 1723 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.50	1-(2-butoxyethoxy)ethanol	100000
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard d-10 Anthracene.

TABLE A148. SAMPLE NC 1723 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.45	1-(2-butoxyethoxy)ethanol	~250000
0.64	2-butoxyethanol	~95000
1.00	D-10 ANTHRACENE	IS
1.17	di-n-butylphthalate	270
1.43	bis(2-ethylhexyl)phthalate	510
1.53	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A149. FIELD BLANK NC1742 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard d-10 Anthracene.

TABLE A150. FIELD BLANK NC 1742 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.47	1-(2-butoxyethoxy)ethanol	~230000
0.65	2-butoxyethanol	~96000
1.00	D-10 ANTHRACENE	IS
1.17	di-n-butylphthalate	110
1.40	bis(2-ethylhexyl)phthalate	830

*Relative to the internal standard d-10 Anthracene.

TABLE A151. SAMPLE NC 1865 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.44	unknown	
0.52	1-(2-butoxyethoxy)ethanol	∿400000
1.00	D-10 ANTHRACENE	IS
1.04	di-n-butylphthalate	370
1.26	bis(2-ethylhexyl)phthalate	90

*Relative to the internal standard d-10 Anthracene.

TABLE A152. SAMPLE 1865 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.61	1-(2-butoxyethoxy)ethanol	∿300000
0.67	2-butoxyethanol	∿43000
1.00	D-10 ANTHRACENE	IS
1.10	di-n-butylphthalate	650
1.46	bis(2-ethylhexyl)phthalate	520

*Relative to the internal standard d-10 Anthracene.

TABLE A153. FIELD BLANK NC 1824 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.26	bis(2-ethylhexyl)phthalate	410

*Relative to the internal standard d-10 Anthracene.

TABLE A154. FIELD BLANK NC 1824 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.50	1-(2-butoxyethoxy)ethanol	~49000
0.63	unknown	
1.00	D-10 ANTHRACENE	IS
1.11	di-n-butylphthalate	600
1.43	bis(2-ethylhexyl)phthalate	1600

*Relative to the internal standard d-10 Anthracene.

TABLE A155. FIELD BLANK NC 1858 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.15	bis(2-ethylhexyl)phthalate	110

*Relative to the internal standard d-10 Anthracene.

TABLE A156. SAMPLE NC 1929 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.16	computer failure	
0.48	computer failure	
1.00	D-10 ANTHRACENE	IS
1.01	di-n-butylphthalate	1200
1.23	bis(2-ethylhexyl)phthalate	360

*Relative to the internal standard d-10 Anthracene.

TABLE A157. SAMPLE NC 1929 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.09	di-n-butylphthalate	530
1.34	bis(2-ethylhexyl)phthalate	680

*Relative to the internal standard d-10 Anthracene.

TABLE A158. FIELD BLANK NC 1902 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.48	1-(2-butoxyethoxy)ethanol	∿330000
0.62	2-butoxyethanol	∿250000
0.82	column bleed	
0.92	column bleed	
1.00	D-10 ANTHRACENE	IS
1.02	column bleed	
1.11	unknown phthalate	
1.19	column bleed	
1.34	column bleed	
1.43	bis(2-ethylhexyl)phthalate	790
1.50	column bleed	

*Relative to the internal standard d-10 Anthracene.

TABLE A159. FIELD BLANK NC 1930 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.53	1-(2-butoxyethoxy)ethanol	computer failure
0.85	diethylphthalate	120
1.00	D-10 ANTHRACENE	IS
1.09	di-n-butylphthalate	220
1.39	bis(2-ethylhexyl)phthalate	51

*Relative to the internal standard d-10 Anthracene.

TABLE A160. FIELD BLANK NC 1930 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.43	column bleed	
0.46	1-(2-butoxyethoxy)ethanol	~250000
0.56	unknown	
0.62	2-butoxyethanol	~23000
0.69	column bleed	
0.80	column bleed	
0.91	column bleed	
0.98	column bleed	
1.00	D-10 ANTHRACENE	IS
1.09	column bleed	
1.17	column bleed	
1.24	column bleed	
1.31	column bleed	
1.37	column bleed	
1.44	bis(2-ethylhexyl)phthalate	280
1.53	column bleed	

*Relative to the internal standard d-10 Anthracene.

TABLE A161. SAMPLE NC 20218 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.53	1-(2-butoxyethoxy)ethanol	390000
1.00	D-10 ANTHRACENE	IS
1.06	unknown	
1.26	bis(2-ethylhexyl)phthalate	180

*Relative to the internal standard d-10 Anthracene.

TABLE A162. SAMPLE NC 20218 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.50	1-(2-butoxyethoxy)ethanol	~100000
0.51	unknown	
0.64	$C_6H_{12}O_2$ isomer	
1.00	D-10 ANTHRACENE	IS
1.10	di-n-butylphthalate	1500
1.37	bis(2-ethylhexyl)phthalate	9700
1.47	unknown alkane	

*Relative to the internal standard d-10 Anthracene.

TABLE A163. FIELD BLANK NC 2027 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.48	1-(2-butoxyethoxy)ethanol	>67000
0.63	unknown	
1.00	D-10 ANTHRACENE	IS
1.13	di-n-butylphthalate	1100
1.46	bis(2-ethylhexyl)phthalate	1300

*Relative to the internal standard d-10 Anthracene.

TABLE A164. FIELD BLANK NC 20216 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.95	dimethylphthalate	52
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	160
1.27	bis(2-ethylhexyl)phthalate	500

*Relative to the internal standard d-10 Anthracene.

TABLE A165. FIELD BLANK NC 20216 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.89	unknown	
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.06	unknown	
1.13	unknown	
1.19	tridecane	6000
1.25	hexadecane	19000
1.30	unknown	
1.36	unknown alkane	
1.43	unknown alkane	
1.49	bis(2-ethylhexyl)phthalate	340
1.57	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A166. SAMPLE 2129 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.49	1-(2-butoxyethoxy)ethanol	500000
1.00	D-10 ANTHRACENE	IS
1.06	unknown alkane	
1.11	unknown alkane	
1.15	unknown alkane	
1.20	unknown alkane	
1.25	bis(2-ethylhexyl)phthalate	500
1.29	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A167. Sample NC 2129 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.47	1-(-butoxyethoxy)ethanol (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.07	unknown phthalate	
1.22	computer failure	
1.46	bis(2-ethylhexyl)phthalate	11000

*Relative to the internal standard d-10 Anthracene.

TABLE A168. FIELD BLANK NC 2102 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.50	computer failure	
0.76	computer failure	
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	160
1.20	computer failure	
1.21	bis(2-ethylhexyl)phthalate	470

*Relative to the internal standard d-10 Anthracene.

TABLE A169. FIELD BLANK NC 2102 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.45	1-(2-butoxyethoxy)ethanol	>67000
0.64	unknown	
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	1000
1.12	unknown	
1.19	column bleed	
1.27	column bleed	
1.35	column bleed	
1.44	bis(2-ethylhexyl)phthalate	1200

*Relative to the internal standard d-10 Anthracene.

TABLE A170. FIELD BLANK NC 2114 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.22	bis(2-ethylhexyl)phthalate	730

*Relative to the internal standard d-10 Anthracene.

TABLE A171. SAMPLE NC 2114 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	unknown	
0.94	unknown	
1.00	D-10 ANTHRACENE	IS
1.42	bis(2-ethylhexyl)phthalate	1500

*Relative to the internal standard d-10 Anthracene.

TABLE A172. SAMPLE NC2214 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.07	di-n-butylphthalate	3300
1.20	bis(2-ethylhexyl) phthalate	230

*Relative to the internal standard d-10 Anthracene.

TABLE A173. SAMPLE NC 2214 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.67	unknown	
0.68	unknown	
1.00	D-10 ANTHRACENE	IS
1.11	di-n-butylphthalate	610
1.45	bis(ethylhexyl) phthalate	160
1.54	unknown	

*Relative to the internal standard d-10 Anthracene.

TABLE A174. FIELD BLANK NC 2202 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.55	unknown	
0.77	unknown	
0.83	diethylphthalate	200
1.00	D-10 ANTHRACENE	IS
1.05	di-n-butylphthalate	4000
1.15	computer failure	
1.21	bis(2-ethylhexyl)phthalate	100

*Relative to the internal standard d-10 Anthracene.

TABLE A175. FIELD BLANK NC 2202 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.54	1-(2-butoxyethoxy)ethanol	∿98000
0.68	2-butoxyethanol	∿15000
1.00	D-10 ANTHRACENE	IS
1.03	bis(2-ethylhexyl)phthalate	400

*Relative to the internal standard d-10 Anthracene.

TABLE A176. SAMPLE NC 2230 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.55	2-(2-butoxyethoxy)ethanol	∿33000
1.00	D-10 ANTHRACENE	IS
1.07	di-n-butylphthalate	81
1.27	bis(2-ethylhexyl)phthalate	110

*Relative to the internal standard d-10 Anthracene.

TABLE A177. SAMPLE NC 2230 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.54	1-(2-butoxyethoxy)ethanol	∿11000
1.00	D-10 ANTHRACENE	IS
1.12	unknown phthalate	

*Relative to the internal standard d-10 Anthracene.

APPENDIX B
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES FROM OIL REFINERIES - SAMPLE LIST

Organization	Site	Sample description	Sample code
RETA/EGD	Texas City, TX	Water sample from Amoco Oil Company	181-9
RETA/EGD	Commerce City, CO	Water sample from Asmera Oil Company	C-512
RETA/EGD	Toledo, OH	Water sample from Sun Oil Company	I-515
RETA/EGD	El Dorado, KS	Water sample from Getty Refining and Marketing Company	G-607
RETA/EGD	Newell, WV	Water sample from Quaker State Refining Corporation	Q-902

TABLE BL. MERCURY ANALYSIS OF EFFLUENTS FROM OIL REFINERIES

Sample Number/Oil Refinery		Concentration (ppb Hg)
181-1	(Amoco Oil Co.)	<0.2
C-512	(Asmera Oil Inc.)	0.5
I-515	(Sun Oil Co.)	0.5
G-607	(Getty Refining and Marketing Co.)	0.2
Q-902	(Quaker State Oil Refining Corp.)	0.2

TABLE B2. SSMS DATA FOR RETA SAMPLE 181-9.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈0.1	Neodymium	<0.003	Strontium	0.5
Antimony	<0.003	Gadolinium	<0.003	Nickel	INT	Sulfur	MC
Arsenic	0.05	Gallium	0.002	Niobium	<0.003	Tantalum	<0.003
Barium	0.008	Germanium	<0.003	Osmium	<0.003	Tellurium	<0.003
Beryllium	<0.003	Gold	<0.003	Palladium	<0.003	Terbium	<0.003
Bismuth	0.006	Hafnium	<0.003	Phosphorus	0.4	Thallium	<0.003
Boron	0.02	Holmium	<0.003	Platinum	<0.003	Thorium	<0.003
Bromine	0.6	Indium	STD	Potassium	MC	Thulium	<0.003
Cadmium	0.007	Iodine	<0.003	Praseodymium	<0.003	Tin	0.006
Calcium	MC	Iridium	<0.003	Rhenium	<0.003	Titanium	0.03
Cerium	<0.003	Iron	0.3	Rhodium	<0.003	Tungsten	<0.003
Cesium	0.04	Lanthanum	<0.003	Rubidium	0.003	Uranium	<0.003
Chlorine	MC	Lead	0.01	Ruthenium	<0.003	Vanadium	0.002
Chromium	0.02	Lithium	0.02	Samarium	<0.003	Ytterbium	<0.003
Cobalt	0.002	Lutetium	<0.003	Scandium	≤0.002	Yttrium	<0.003
Copper	0.04	Magnesium	MC	Selenium	0.004	Zinc	0.09
Dysprosium	<0.003	Manganese	0.06	Silicon	1	Zirconium	0.004
Erbium	<0.003	Mercury	NR	Silver	<0.003		
Europium	<0.003	Molybdenum	0.07	Sodium	>8		

NR - Not reported

MC - Major component

INT - Interference

TABLE B3. SSMS DATA FOR RETA FIELD BLANK #181-9 COMP.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈3	Neodymium	<0.001	Strontium	2
Antimony	0.007	Gadolinium	<0.001	Nickel	INT	Sulfur	≥6
Arsenic	0.08	Gallium	≤0.001	Niobium	0.004	Tantalum	<0.001
Barium	0.5	Germanium	0.002	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.006	Hafnium	<0.001	Phosphorus	MC	Thallium	<0.001
Boron	0.4	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.007	Iodine	0.01	Praseodymium	≤0.001	Tin	0.02
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.02
Cerium	0.003	Iron	0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.004	Rubidium	0.004	Uranium	0.01
Chlorine	2	Lead	0.04	Ruthenium	<0.001	Vanadium	0.003
Chromium	0.1	Lithium	0.3	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.003
Copper	0.1	Magnesium	MC	Selenium	0.05	Zinc	0.1
Dysprosium	<0.001	Manganese	0.5	Silicon	MC	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	0.004		
Europium	<0.001	Molybdenum	0.03	Sodium	≥3		

NR – Not Reported
MC – Major Component
INT – Interference

TABLE B4. SSMS DATA FOR RETA SAMPLE C-512.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.5	Fluorine	≈2	Neodymium	<0.002	Strontium	0.2
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.06	Sulfur	>9
Arsenic	0.01	Gallium	0.002	Niobium	0.003	Tantalum	<0.002
Barium	0.1	Germanium	0.001	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	0.005	Hafnium	<0.002	Phosphorus	MC	Thallium	<0.002
Boron	0.4	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.5	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.005	Iodine	0.3	Praseodymium	<0.002	Tin	0.003
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.02
Cerium	0.004	Iron	0.9	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	0.004	Rubidium	0.005	Uranium	0.04
Chlorine	2	Lead	0.06	Ruthenium	<0.002	Vanadium	0.009
Chromium	0.4	Lithium	0.4	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.003	Lutetium	<0.002	Scandium	≤0.001	Yttrium	0.002
Copper	0.09	Magnesium	5	Selenium	0.007	Zinc	0.8
Dysprosium	<0.002	Manganese	0.008	Silicon	3	Zirconium	0.02
Erbium	<0.002	Mercury	NR	Silver	0.002		
Europium	<0.002	Molybdenum	0.07	Sodium	>4		

NR - Not Reported

MC - Major Component

TABLE B5. SSMS DATA FOR RETA FIELD BLANK #512 COMP.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈7	Neodymium	<0.002	Strontium	0.8
Antimony	≤0.006	Gadolinium	<0.002	Nickel	0.1	Sulfur	MC
Arsenic	0.04	Gallium	≤0.003	Niobium	0.002	Tantalum	<0.002
Barium	<0.001	Germanium	0.003	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	MC	Thallium	<0.002
Boron	2	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	≤0.006	Iodine	0.009	Praseodymium	<0.002	Tin	0.02
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.04
Cerium	<0.002	Iron	5	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.001	Lanthanum	<0.002	Rubidium	0.02	Uranium	<0.002
Chlorine	0.7	Lead	0.09	Ruthenium	<0.002	Vanadium	0.01
Chromium	0.2	Lithium	0.5	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.04	Lutetium	<0.002	Scandium	≤0.002	Yttrium	≤0.001
Copper	0.1	Magnesium	MC	Selenium	0.04	Zinc	3
Dysprosium	<0.002	Manganese	0.8	Silicon	MC	Zirconium	0.003
Erbium	<0.002	Mercury	NR	Silver	0.006		
Europium	<0.002	Molybdenum	0.02	Sodium	≥5		

NR - Not Reported
MC - Major Component

TABLE B6. SSMS DATA FOR RETA FIELD BLANK #515 COMP.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.5	Neodymium	<0.003	Strontium	2
Antimony	<0.003	Gadolinium	<0.003	Nickel	0.2	Sulfur	MC
Arsenic	0.02	Gallium	0.003	Niobium	0.008	Tantalum	<0.003
Barium	0.2	Germanium	≤0.002	Osmium	<0.003	Tellurium	<0.003
Beryllium	<0.003	Gold	<0.003	Palladium	<0.003	Terbium	<0.003
Bismuth	0.01	Hafnium	<0.003	Phosphorus	5	Thallium	<0.003
Boron	0.1	Holmium	<0.003	Platinum	<0.003	Thorium	<0.003
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.003
Cadmium	0.007	Iodine	0.006	Praseodymium	<0.003	Tin	0.03
Calcium	MC	Iridium	<0.003	Rhenium	<0.003	Titanium	≤0.09
Cerium	0.009	Iron	0.4	Rhodium	<0.003	Tungsten	0.02
Cesium	<0.003	Lanthanum	0.01	Rubidium	0.007	Uranium	0.03
Chlorine	1	Lead	0.02	Ruthenium	<0.003	Vanadium	0.06
Chromium	0.06	Lithium	0.04	Samarium	<0.003	Ytterbium	<0.003
Cobalt	0.03	Lutetium	<0.003	Scandium	≤0.004	Yttrium	≤0.003
Copper	0.1	Magnesium	MC	Selenium	0.02	Zinc	0.2
Dysprosium	<0.003	Manganese	0.08	Silicon	3	Zirconium	0.008
Erbium	<0.003	Mercury	NR	Silver	0.01		
Europium	<0.003	Molybdenum	0.04	Sodium	MC		

NR - Not Reported
MC - Major Component

TABLE B7. SSMS DATA FOR RETA SAMPLE I-515.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.3	Neodymium	<0.002	Strontium	0.9
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.04	Sulfur	MC
Arsenic	0.01	Gallium	<0.002	Niobium	0.002	Tantalum	<0.002
Barium	0.5	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.8	Thallium	<0.002
Boron	0.009	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.5	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.003	Iodine	0.1	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.1
Cerium	<0.002	Iron	0.5	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	<0.002	Rubidium	0.007	Uranium	0.02
Chlorine	1	Lead	0.03	Ruthenium	<0.002	Vanadium	0.02
Chromium	0.6	Lithium	0.02	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.002	Lutetium	<0.002	Scandium	≤0.001	Yttrium	<0.002
Copper	0.07	Magnesium	MC	Selenium	0.02	Zinc	0.1
Dysprosium	<0.002	Manganese	0.4	Silicon	0.7	Zirconium	<0.002
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.02	Sodium	>5		

NR - Not Reported

MC - Major Component

TABLE B8. SSMS DATA FOR RETA SAMPLE #607.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.07	Fluorine	≈0.7	Neodymium	< 0.001	Strontium	0.4
Antimony	< 0.001	Gadolinium	< 0.001	Nickel	0.002	Sulfur	>4
Arsenic	0.01	Gallium	≤0.001	Niobium	0.003	Tantalum	< 0.001
Barium	0.1	Germanium	< 0.001	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	MC	Thallium	< 0.001
Boron	0.01	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.5	Indium	STD	Potassium	>7	Thulium	< 0.001
Cadmium	0.002	Iodine	0.03	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.009
Cerium	0.001	Iron	0.1	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.004	Uranium	0.02
Chlorine	0.8	Lead	0.02	Ruthenium	< 0.001	Vanadium	0.002
Chromium	0.02	Lithium	0.02	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	≤0.001	Lutetium	< 0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.008	Magnesium	MC	Selenium	0.03	Zinc	0.2
Dysprosium	< 0.001	Manganese	0.01	Silicon	1	Zirconium	0.002
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.01	Sodium	>2		

NR - Not reported

MC - Major component

TABLE B9. SSMS DATA FOR RETA FIELD BLANK #607 COMP.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	MC	Neodymium	<0.002	Strontium	3
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.2	Sulfur	MC
Arsenic	0.04	Gallium	0.003	Niobium	0.005	Tantalum	<0.002
Barium	0.4	Germanium	≤0.001	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	0.004	Hafnium	<0.002	Phosphorus	3	Thallium	<0.002
Boron	0.4	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.4	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	<0.002	Iodine	0.002	Praseodymium	<0.002	Tin	0.02
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.05
Cerium	0.003	Iron	2	Rhodium	<0.002	Tungsten	0.01
Cesium	<0.002	Lanthanum	≤0.005	Rubidium	0.004	Uranium	0.02
Chlorine	3	Lead	0.04	Ruthenium	<0.002	Vanadium	0.007
Chromium	0.3	Lithium	0.06	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.04	Lutetium	<0.002	Scandium	≤0.002	Yttrium	≤0.003
Copper	0.1	Magnesium	MC	Selenium	0.05	Zinc	0.1
Dysprosium	<0.002	Manganese	0.1	Silicon	7	Zirconium	0.006
Erbium	<0.002	Mercury	NR	Silver	0.009		
Europium	<0.002	Molybdenum	0.2	Sodium	≥5		

NR - Not Reported
MC - Major Component

TABLE B10. SSMS DATA FOR RETA SAMPLE #902.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.06	Fluorine	≈0.1	Neodymium	<0.001	Strontium	MC
Antimony	0.002	Gadolinium	<0.001	Nickel	INT	Sulfur	>2
Arsenic	0.4	Gallium	≤0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.3	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.3	Thallium	<0.001
Boron	0.003	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	3	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	<0.001	Iodine	0.009	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	<0.001	Iron	5	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.001	Lanthanum	0.002	Rubidium	0.009	Uranium	≤0.003
Chlorine	MC	Lead	0.004	Ruthenium	<0.001	Vanadium	≤0.001
Chromium	<0.001	Lithium	0.08	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.2	Magnesium	MC	Selenium	0.002	Zinc	0.2
Dysprosium	<0.001	Manganese	1	Silicon	0.3	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.003	Sodium	>0.8		

INT - Interference

NR - Not Reported

MC - Major Component

TABLE B11. SSMS DATA FOR RETA FIELD BLANK #902 COMP.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈3	Neodymium	<0.002	Strontium	3
Antimony	0.003	Gadolinium	<0.002	Nickel	INT	Sulfur	MC
Arsenic	4	Gallium	0.01	Niobium	0.01	Tantalum	<0.002
Barium	0.05	Germanium	0.009	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	0.04	Hafnium	<0.002	Phosphorus	MC	Thallium	<0.002
Boron	0.4	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	2	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.006	Iodine	<0.001	Praseodymium	<0.002	Tin	0.01
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.04
Cerium	0.003	Iron	3	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.001	Lanthanum	0.004	Rubidium	0.007	Uranium	≤0.02
Chlorine	MC	Lead	0.03	Ruthenium	<0.002	Vanadium	0.01
Chromium	0.05	Lithium	0.3	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.006	Lutetium	<0.002	Scandium	≤0.002	Yttrium	0.008
Copper	0.1	Magnesium	MC	Selenium	0.02	Zinc	0.8
Dysprosium	<0.002	Manganese	0.6	Silicon	MC	Zirconium	0.01
Erbium	<0.002	Mercury	NR	Silver	0.006		
Europium	<0.002	Molybdenum	0.02	Sodium	≥5		

NR - Not Reported
MC - Major Component
INT – Interference

TABLE B12. RETA SAMPLE #181-9 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	9
0.19	air	
1.00	1,2-DIBROMOETHANE	IS
1.71	unknown	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B13. RETA SAMPLE BLANK #181-9B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	25
0.20	acetone	∿4
0.38	chloroform	5
0.55	cyclohexane	17
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B14. RETA SAMPLE #C-512 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	13
1.00	1,2-DIBROMOETHANE	IS
1.80	unknown	
1.95	$C_{10}H_{10}$ isomer (tentative)	NQ
2.33	unknown	
2.37	unknown + column artifact	
2.45	unknown + column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B15. RETA SAMPLE BLANK #C-512B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	130
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B16. RETA SAMPLE #I-515 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	74
0.60	cyclohexane	68
0.93	benzene	2
1.00	1,2-DIBROMOETHANE	IS
1.08	methylcyclohexane	9
1.38	toluene	<1
1.44	unknown	
1.58	dimethylcyclohexane isomer (tentative)	NQ
1.64	trimethylcyclohexane isomer (tentative)	NQ
1.77	unknown	
2.02	t-butylthiophene isomer (tentative) + C_9H_{18} isomer (tentative)	NQ NQ
2.06	$C_7H_{10}S$ isomer (tentative)	NQ
2.19	unknown + column artifact	
2.24	unknown + column artifact	
2.29	unknown + column artifact	
2.38	branched $C_{10}H_{22}$ isomer + column artifact	∿11000

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B17. RETA SAMPLE BLANK #I-515B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	46
0.38	chloroform	<1
0.90	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.50	toluene	<1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B18. RETA SAMPLE #G-607 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	12
0.18	dimethyl sulfide (tentative)	NQ
0.28	unknown	
0.49	C_3H_8S isomer (tentative)	NQ
0.58	cyclohexane	12
0.74	dimethyl disulfide (tentative)	NQ
0.82	$C_4H_{10}S$ isomer (tentative)	NQ
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.57	toluene	<1
1.99	column artifact	
2.10	unknown	
2.18	m- and/or p-xylene	<1
2.23	o-xylene	1
2.40	$C_7H_{18}S$ isomer (tentative)	NQ
2.44	column artifact	
2.51	unknown	
2.55	unknown	
2.62	unknown	
2.70	C_9H_{12} isomer	<1
2.88	unknown	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B19. RETA SAMPLE BLANK #G-607B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	44
0.56	cyclohexane	15
0.81	unknown	
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B20. RETA SAMPLE #Q-902 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	<1
1.00	1,2-DIBROMOETHANE	IS
1.34	instrument noise	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B21. RETA SAMPLE BLANK #Q-902B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	59
0.37	chloroform	1
1.00	1,2-DIBRGMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE B22. RETA SAMPLE #181-9 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.13	di-n-butyl phthalate	3

*Relative to the internal standard D-10 Anthracene.

TABLE B23. RETA SAMPLE #181-9 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE B24. RETA SAMPLE #C-512 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE B25. RETA SAMPLE #C-512 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.94	unknown	
0.97	n-heptadecane	64
1.00	D-10 ANTHRACENE	IS
1.05	n-octadecane	25
1.11	n-nonadecane	46

*Relative to the internal standard D-10 Anthracene.

TABLE B26. RETA SAMPLE #I-515 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.80	n-pentadecane	12
0.88	n-hexadecane	10
0.97	n-heptadecane	13
0.97	$\sim C_{18}$ alkane	$\sim$15
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	7
1.12	n-nonadecane	13
1.18	n-eicosane	1
1.25	n-heneicosane	18
1.32	n-docosane	9
1.38	n-tricosane	14
1.44	n-tetracosane	11

*Relative to the internal standard D-10 Anthracene.

TABLE B27. RETA SAMPLE #I-515 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	1300
0.36	o-cresol	16
0.38	p-cresol	3700
0.80	n-pentadecane	36
0.88	n-hexadecane	52
0.93	C_{17} alkane	∿50
0.97	n-heptadecane	86
0.97	C_{18} alkane	∿65
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	42
1.09	∿C_{19} alkane	∿48
1.12	n-nonadecane	58
1.19	n-eicosane	40
1.25	n-heneicosane	29
1.32	n-docosane	23

*Relative to the internal standard D-10 Anthracene.

TABLE B28. RETA SAMPLE G-607 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.13	di-n-butyl phthalate	2
1.44	∿C_{24} alkane	<1

*Relative to the internal standard D-10 Anthracene.

TABLE B29. RETA SAMPLE #G-607 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE B30. RETA SAMPLE #Q-902 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE B31. RETA SAMPLE #Q-902 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

APPENDIX C
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES FROM OIL SHALE OPERATIONS - SAMPLE LIST

Organization	Site	Sample description	Sample code
Paraho Development Corporation/DEI	Anvil Points, CO	Mine dust control water	Mine dust control water
Paraho Development Corporation/DEI	Anvil Points, CO	Groundwater from Well No. 4	Well No. 4
Paraho Development Corporation/DEI	Anvil Points, CO	Water from industrial pond	Par Industrial Pond
Paraho Development Corporation/DEI	Anvil Points, CO	Recycled gas condensate	Recycled gas condensate
Paraho Development Corporation/DEI	Anvil Points, CO	Product water from Tank 522	Process water TK 522
Paraho Development Corporation/DEI	Anvil Points, CO	Product water from Tank 500	Process water TK 500
DOE/LLL	Livermore, CA	Product water collected 26.15 hr after initiation of retorting process on 11-7-78	LLL #1
DOE/LLL	Livermore, CA	Product water collected 30.40 hr after initiation of retorting process on 11-7-78	LLL #2
DOE/LLL	Livermore, CA	Product water collected 34 hr after initiation of retorting process on 11-7-78	LLL #3
DOE/LLL	Livermore, CA	Product water collected 37.25 hr after initiation of retorting process on 11-7-78	LLL #4
DOE/LLL	Livermore, CA	Product water collected 42 hr after initiation of retorting process on 11-8-78	LLL #5
DOE/LLL	Livermore, CA	Product water collected 47.90 hr after initiation of retorting process on 11-8-78	LLL #6
DOE/LLL	Livermore, CA	Product water collected 50.76 hr after initiation of retorting process on 11-8-78	LLL #7
DOE/LLL	Livermore, CA	Product water collected 54.33 hr after initiation of retorting process on 11-8-78	LLL #8
DOE/LLL	Livermore, CA	Product water collected 57.84 hr after initiation of retorting process on 11-8-78	LLL #9
DOE/LLL	Livermore, CA	Product water collected 61.43 hr after initiation of retorting process on 11-8-78	LLL #10

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
DOE/LLL	Livermore, CA	Product water collected 65.76 hr after initiation of retorting process on 11-9-78	LLL #11
DOE/LLL	Livermore, CA	Product water collected 70.00 hr after initiation of retorting process on 11-9-78	LLL #12
DOE/LLL	Livermore, CA	Product water collected 74.23 hr after initiation of retorting process on 11-9-78	LLL #13
DOE/LLL	Livermore, CA	Product water collected 74.23 hr after initiation of retorting process on 11-9-78	LLL #14
DOE/LLL	Livermore, CA	Product water collected 76.38 hr after initiation of retorting process on 11-9-78	LLL #15
DOE/LLL	Livermore, CA	Product water collected 76.38 hr after initiation of retorting process on 11-9-78	LLL #16
DOE/LLL	Livermore, CA	Product water collected 78.43 hr after initiation of retorting process on 11-9-78	LLL #17
DOE/LLL	Livermore, CA	Product water collected 78.43 hr after initiation of retorting process on 11-9-78	LLL #18
DOE/LLL	Livermore, CA	Product water collected 80.15 hr after initiation of retorting process on 11-9-78	LLL #19
DOE/LLL	Livermore, CA	Product water collected 82.45 hr after initiation of retorting process on 11-9-78	LLL #20
DOE/LLL	Livermore, CA	Product water collected 85.76 hr after initiation of retorting process on 11-9-78	LLL #21
DOE/LLL	Livermore, CA	Product water collected 88.75 hr after initiation of retorting process on 11-9-78	LLL #22
DOE/LLL	Livermore, CA	Sample of water used in retorting process on 11-7-78	LLL blank 11-7-78
DOE/LLL	Livermore, CA	Sample of water used in retorting process on 11-8-78	LLL blank 11-8-78

TABLE C1. MERCURY ANALYSIS OF EFFLUENTS FROM PARAHOE OIL SHALE PROJECT

Sample Identification	Concentration (ppb Hg)
Mine Dust Control Water	<0.4
Well #4	<0.4
Industrial Pond	<0.4
Recycle Gas Condensate	0.05*
Process Water TK 522	4.8
Product Water TK 500	0.06*

*µg/g

TABLE C2. MERCURY ANALYSIS OF EFFLUENTS FROM THE LAWRENCE LIVERMORE LABORATORY OIL SHALE PROJECT

Sample Identification		Concentration (ppb Hg)
LLL#1	(26:15, 11/7/78)	1.3
LLL#2	(30:40, 11/7/78)	1.3
LLL#3	(34:00, 11/7/78)	1.6
LLL#4	(37:25, 11/7/78)	1.4
LLL#5	(42:06, 11/8/78)	0.8
LLL#6	(47:90, 11/8/78)	2.7
LLL#7	(50:76, 11/8/78)	1.4
LLL#8	(54:33, 11/8/78)	2.0
LLL#9	(57:84, 11/8/78)	3.0
LLL#10	(61:43, 11/8/78)	7.3
LLL#11	(65:76, 11/9/78)	15.2
LLL#12	(70:00, 11/9/78)	22.8
LLL#13	(74:23, 11/9/78)	48.0
LLL#14	(74:23, 11/9/78)	29
LLL#15	(76:38, 11/9/78)	52
LLL#16	(76:38, 11/9/78)	49
LLL#17	(78:43, 11/9/78)	52
LLL#18	(78:43, 11/9/78)	49
LLL#19	(80:15, 11/9/78)	48
LLL#20	(82:45, 11/9/78)	40
LLL#21	(85:76, 11/9/78)	44
LLL#22	(88:75, 11/9/78)	58

TABLE C3. SSMS DATA FOR SAMPLE PAR-MINE DUST CONTROL WATER

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈0.2	Neodymium	< 0.001	Strontium	2
Antimony	< 0.001	Gadolinium	< 0.001	Nickel	0.004	Sulfur	>6
Arsenic	0.005	Gallium	<0.001	Niobium	< 0.001	Tantalum	< 0.001
Barium	0.09	Germanium	< 0.001	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	MC	Thallium	< 0.001
Boron	0.02	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	.003	Iodine	0.002	Praseodymium	< 0.001	Tin	0.002
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.01
Cerium	0.002	Iron	3	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	< 0.001	Lanthanum	0.002	Rubidium	0.009	Uranium	0.02
Chlorine	0.6	Lead	0.01	Ruthenium	< 0.001	Vanadium	0.003
Chromium	0.01	Lithium	0.03	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	< .001	Lutetium	< 0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.03	Magnesium	MC	Selenium	0.005	Zinc	0.9
Dysprosium	< 0.001	Manganese	0.3	Silicon	0.8	Zirconium	0.005
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.04	Sodium	>3		

NR - Not Reported

MC - Major Component

TABLE C4. SSMS DATA FOR SAMPLE PAR-WELL #4

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.9	Fluorine	≈0.3	Neodymium	< 0.001	Strontium	6
Antimony	< 0.001	Gadolinium	< 0.001	Nickel	0.02	Sulfur	>6
Arsenic	0.02	Gallium	0.001	Niobium	0.001	Tantalum	< 0.001
Barium	0.1	Germanium	≤0.002	Osmium	< 0.001	Tellurium	≤0.007
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.2	Thallium	< 0.001
Boron	0.07	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.07	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	0.003	Iodine	0.003	Praseodymium	0.001	Tin	0.007
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.2
Cerium	0.006	Iron	2	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	<0.001	Lanthanum	0.004	Rubidium	0.03	Uranium	0.03
Chlorine	1	Lead	0.02	Ruthenium	< 0.001	Vanadium	0.007
Chromium	0.01	Lithium	0.9	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	0.007	Lutetium	< 0.001	Scandium	≤0.001	Yttrium	0.003
Copper	0.03	Magnesium	MC	Selenium	0.006	Zinc	0.1
Dysprosium	< 0.001	Manganese	10	Silicon	MC	Zirconium	0.02
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.03	Sodium	>2		

NR - Not Reported

MC - Major Component

TABLE C5. SSMS DATA FOR SAMPLE PAR-INDUSTRIAL POND

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈1	Neodymium	< 0.002	Strontium	1
Antimony	0.01	Gadolinium	< 0.002	Nickel	INT	Sulfur	MC
Arsenic	2	Gallium	0.001	Niobium	0.002	Tantalum	< 0.002
Barium	0.2	Germanium	≤0.004	Osmium	< 0.002	Tellurium	≤0.02
Beryllium	< 0.002	Gold	< 0.002	Palladium	< 0.002	Terbium	< 0.002
Bismuth	< 0.002	Hafnium	< 0.002	Phosphorus	5	Thallium	< 0.002
Boron	0.3	Holmium	< 0.002	Platinum	< 0.002	Thorium	< 0.002
Bromine	0.06	Indium	STD	Potassium	MC	Thulium	< 0.002
Cadmium	0.005	Iodine	0.03	Praseodymium	< 0.002	Tin	0.01
Calcium	MC	Iridium	< 0.002	Rhenium	< 0.002	Titanium	< 0.04
Cerium	0.002	Iron	0.4	Rhodium	< 0.002	Tungsten	< 0.002
Cesium	0.001	Lanthanum	0.004	Rubidium	0.03	Uranium	0.06
Chlorine	MC	Lead	0.02	Ruthenium	< 0.002	Vanadium	0.01
Chromium	0.01	Lithium	0.9	Samarium	< 0.002	Ytterbium	< 0.002
Cobalt	0.005	Lutetium	< 0.002	Scandium	≤0.002	Yttrium	0.001
Copper	0.02	Magnesium	MC	Selenium	0.09	Zinc	0.08
Dysprosium	< 0.002	Manganese	0.2	Silicon	4	Zirconium	0.004
Erbium	< 0.002	Mercury	NR	Silver	< 0.002		
Europium	< 0.002	Molybdenum	0.07	Sodium	≥4		

INT - Interference

NR - Not Reported

MC - Major Component

TABLE C6. SSMS DATA FOR SAMPLE PARAHOE GAS CONDENSATE

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.008	Fluorine	≈0.2	Neodymium	<0.006	Strontium	0.08
Antimony	0.02	Gadolinium	<0.006	Nickel	0.05	Sulfur	2
Arsenic	0.03	Gallium	≤0.006	Niobium	<0.006	Tantalum	<0.006
Barium	0.1	Germanium	<0.006	Osmium	<0.006	Tellurium	<0.006
Beryllium	<0.006	Gold	<0.006	Palladium	<0.006	Terbium	<0.006
Bismuth	<0.006	Hafnium	<0.006	Phosphorus	0.4	Thallium	<0.006
Boron	0.02	Holmium	<0.006	Platinum	<0.006	Thorium	<0.006
Bromine	0.1	Indium	STD	Potassium	2	Thulium	<0.006
Cadmium	<0.006	Iodine	0.007	Praseodymium	<0.006	Tin	<0.006
Calcium	MC	Iridium	<0.006	Rhenium	<0.006	Titanium	0.2
Cerium	0.008	Iron	0.1	Rhodium	<0.006	Tungsten	<0.006
Cesium	0.03	Lanthanum	0.02	Rubidium	0.002	Uranium	<0.006
Chlorine	0.08	Lead	≤0.04	Ruthenium	<0.006	Vanadium	0.002
Chromium	0.1	Lithium	0.1	Samarium	<0.006	Ytterbium	<0.006
Cobalt	0.002	Lutetium	<0.006	Scandium	≤0.004	Yttrium	0.005
Copper	0.4	Magnesium	1	Selenium	≤0.01	Zinc	0.4
Dysprosium	<0.006	Manganese	0.009	Silicon	2	Zirconium	0.04
Erbium	<0.006	Mercury	NR	Silver	<0.006		
Europium	<0.006	Molybdenum	0.2	Sodium	MC		

NR - Not Reported
MC - Major Component

TABLE C7. SSMS DATA FOR SAMPLE PAR-PROCESS WATER TK-522

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≃0.07	Neodymium	< 0.01	Strontium	0.07
Antimony	0.03	Gadolinium	< 0.01	Nickel	0.04	Sulfur	6
Arsenic	0.9	Gallium	< 0.01	Niobium	< 0.01	Tantalum	< 0.01
Barium	0.1	Germanium	< 0.01	Osmium	< 0.01	Tellurium	< 0.01
Beryllium	< 0.01	Gold	< 0.01	Palladium	< 0.01	Terbium	< 0.01
Bismuth	< 0.01	Hafnium	< 0.01	Phosphorus	2	Thallium	< 0.01
Boron	≤ 0.02	Holmium	< 0.01	Platinum	< 0.01	Thorium	< 0.01
Bromine	< 0.01	Indium	STD	Potassium	MC	Thulium	< 0.01
Cadmium	< 0.01	Iodine	0.01	Praseodymium	< 0.01	Tin	< 0.01
Calcium	4	Iridium	< 0.01	Rhenium	< 0.01	Titanium	0.09
Cerium	< 0.01	Iron	2	Rhodium	< 0.01	Tungsten	< 0.01
Cesium	< 0.01	Lanthanum	< 0.01	Rubidium	0.005	Uranium	0.07
Chlorine	0.5	Lead	0.04	Ruthenium	< 0.01	Vanadium	0.007
Chromium	0.02	Lithium	0.003	Samarium	< 0.01	Ytterbium	< 0.01
Cobalt	0.003	Lutetium	< 0.01	Scandium	≤ 0.001	Yttrium	< 0.01
Copper	0.9	Magnesium	1	Selenium	0.1	Zinc	0.6
Dysprosium	< 0.01	Manganese	0.02	Silicon	3	Zirconium	< 0.01
Erbium	< 0.01	Mercury	NR	Silver	< 0.01		
Europium	< 0.01	Molybdenum	0.04	Sodium	MC		

NR - Not Reported

MC - Major Component. Sample was thermally ashed at 350°C for 30 min. in a laboratory furnace in a quartz crucible prior to analysis.

TABLE C8. SSMS DATA FOR SAMPLE PARAHOE TK 500

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.8	Fluorine	≈ 0.8	Neodymium	< 0.2	Strontium	0.3
Antimony	< 0.2	Gadolinium	< 0.2	Nickel	3	Sulfur	220
Arsenic	6	Gallium	0.05	Niobium	0.1	Tantalum	< 0.2
Barium	0.3	Germanium	< 0.2	Osmium	< 0.2	Tellurium	< 0.2
Beryllium	< 0.2	Gold	< 0.2	Palladium	< 0.2	Terbium	< 0.2
Bismuth	< 0.2	Hafnium	< 0.2	Phosphorus	2	Thallium	< 0.2
Boron	0.2	Holmium	< 0.2	Platinum	< 0.2	Thorium	< 0.2
Bromine	0.1	Indium	STD	Potassium	17	Thulium	< 0.2
Cadmium	< 0.2	Iodine	≤ 0.1	Praseodymium	< 0.2	Tin	0.1
Calcium	18	Iridium	< 0.2	Rhenium	< 0.2	Titanium	1
Cerium	0.1	Iron	28	Rhodium	< 0.2	Tungsten	< 0.2
Cesium	< 0.2	Lanthanum	0.2	Rubidium	< 0.01	Uranium	< 0.2
Chlorine	1	Lead	0.3	Ruthenium	< 0.2	Vanadium	0.3
Chromium	0.4	Lithium	0.07	Samarium	< 0.2	Ytterbium	< 0.2
Cobalt	1	Lutetium	< 0.2	Scandium	≤ 0.04	Yttrium	< 0.2
Copper	0.2	Magnesium	16	Selenium	≤ 0.2	Zinc	0.5
Dysprosium	< 0.2	Manganese	0.08	Silicon	12	Zirconium	0.1
Erbium	< 0.2	Mercury	NR	Silver	< 0.2		
Europium	< 0.2	Molybdenum	0.3	Sodium	4		

MC - Major component
NR - Not Reported

TABLE C9. SSMS DATA FOR SAMPLE #1 (26:15)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈0.02	Neodymium	<0.07	Strontium	0.02
Antimony	<0.07	Gadolinium	<0.07	Nickel	0.08	Sulfur	1
Arsenic	≤0.02	Gallium	<0.07	Niobium	<0.07	Tantalum	<0.07
Barium	0.05	Germanium	<0.07	Osmium	<0.07	Tellurium	<0.07
Beryllium	<0.07	Gold	<0.07	Palladium	<0.07	Terbium	<0.07
Bismuth	<0.07	Hafnium	<0.07	Phosphorus	0.3	Thallium	<0.07
Boron	0.008	Holmium	<0.07	Platinum	<0.07	Thorium	<0.07
Bromine	<0.07	Indium	STD	Potassium	1	Thulium	<0.07
Cadmium	<0.07	Iodine	<0.07	Praseodymium	<0.07	Tin	<0.07
Calcium	1	Iridium	<0.07	Rhenium	<0.07	Titanium	0.06
Cerium	<0.07	Iron	0.4	Rhodium	<0.07	Tungsten	<0.07
Cesium	<0.07	Lanthanum	<0.07	Rubidium	<0.07	Uranium	<0.07
Chlorine	0.3	Lead	≤0.08	Ruthenium	<0.07	Vanadium	0.005
Chromium	0.009	Lithium	0.003	Samarium	<0.07	Ytterbium	<0.07
Cobalt	<0.07	Lutetium	<0.07	Scandium	≤0.01	Yttrium	<0.07
Copper	0.3	Magnesium	0.2	Selenium	<0.07	Zinc	0.6
Dysprosium	<0.07	Manganese	0.02	Silicon	1	Zirconium	<0.07
Erbium	<0.07	Mercury	NR	Silver	<0.07		
Europium	<0.07	Molybdenum	≤0.2	Sodium	0.6		

STD - Internal Standard
NR - Not Reported

TABLE C10. SSMS DATA FOR SAMPLE #2 (30:40)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈0.2	Neodymium	<0.05	Strontium	0.07
Antimony	<0.05	Gadolinium	<0.05	Nickel	0.1	Sulfur	2
Arsenic	0.07	Gallium	0.01	Niobium	<0.05	Tantalum	<0.05
Barium	0.1	Germanium	<0.05	Osmium	<0.05	Tellurium	<0.05
Beryllium	<0.05	Gold	<0.05	Palladium	<0.05	Terbium	<0.05
Bismuth	<0.05	Hafnium	<0.05	Phosphorus	2	Thallium	<0.05
Boron	<0.001	Holmium	<0.05	Platinum	<0.05	Thorium	<0.05
Bromine	0.05	Indium	STD	Potassium	2	Thulium	<0.05
Cadmium	<0.05	Iodine	<0.05	Praseodymium	<0.05	Tin	<0.05
Calcium	5	Iridium	<0.05	Rhenium	<0.05	Titanium	0.08
Cerium	<0.05	Iron	*0.4	Rhodium	<0.05	Tungsten	<0.05
Cesium	<0.05	Lanthanum	<0.05	Rubidium	<0.05	Uranium	<0.05
Chlorine	0.1	Lead	<0.05	Ruthenium	<0.05	Vanadium	0.002
Chromium	0.02	Lithium	<0.001	Samarium	<0.05	Ytterbium	<0.05
Cobalt	0.1	Lutetium	<0.05	Scandium	≤0.02	Yttrium	<0.05
Copper	0.09	Magnesium	0.7	Selenium	0.02	Zinc	0.2
Dysprosium	<0.05	Manganese	0.02	Silicon	1	Zirconium	<0.05
Erbium	<0.05	Mercury	NR	Silver	<0.05		
Europium	<0.05	Molybdenum	0.04	Sodium	1		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C12. SSMS DATA FOR SAMPLE #4 (37:25)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈0.08	Neodymium	<0.03	Strontium	0.01
Antimony	<0.03	Gadolinium	<0.03	Nickel	0.1	Sulfur	1
Arsenic	*0.06	Gallium	*0.02	Niobium	<0.03	Tantalum	<0.03
Barium	0.03	Germanium	<0.03	Osmium	<0.03	Tellurium	<0.03
Beryllium	<0.03	Gold	<0.03	Palladium	<0.03	Terbium	<0.03
Bismuth	<0.03	Hafnium	<0.03	Phosphorus	0.5	Thallium	<0.03
Boron	≤0.001	Holmium	<0.03	Platinum	<0.03	Thorium	<0.03
Bromine	0.02	Indium	STD	Potassium	1	Thulium	<0.03
Cadmium	<0.03	Iodine	0.007	Praseodymium	<0.03	Tin	<0.03
Calcium	1	Iridium	<0.03	Rhenium	<0.03	Titanium	0.08
Cerium	<0.03	Iron	0.8	Rhodium	<0.03	Tungsten	<0.03
Cesium	<0.03	Lanthanum	<0.03	Rubidium	<0.03	Uranium	<0.03
Chlorine	0.1	Lead	<0.03	Ruthenium	<0.03	Vanadium	≤0.001
Chromium	0.006	Lithium	0.004	Samarium	<0.03	Ytterbium	<0.03
Cobalt	0.002	Lutetium	<0.03	Scandium	≤0.008	Yttrium	<0.03
Copper	0.09	Magnesium	0.06	Selenium	0.02	Zinc	0.1
Dysprosium	<0.03	Manganese	0.009	Silicon	0.5	Zirconium	<0.03
Erbium	<0.03	Mercury	NR	Silver	<0.03		
Europium	<0.03	Molybdenum	0.03	Sodium	0.4		

STD - Internal Standard

NR - Not Reported

*Heterogeneous

TABLE C12. SSMS DATA FOR SAMPLE #4 (37:25)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≃0.08	Neodymium	<0.03	Strontium	0.01
Antimony	<0.03	Gadolinium	<0.03	Nickel	0.1	Sulfur	1
Arsenic	*0.06	Gallium	*0.02	Niobium	<0.03	Tantalum	<0.03
Barium	0.03	Germanium	<0.03	Osmium	<0.03	Tellurium	<0.03
Beryllium	<0.03	Gold	<0.03	Palladium	<0.03	Terbium	<0.03
Bismuth	<0.03	Hafnium	<0.03	Phosphorus	0.5	Thallium	<0.03
Boron	≤0.001	Holmium	<0.03	Platinum	<0.03	Thorium	<0.03
Bromine	0.02	Indium	STD	Potassium	1	Thulium	<0.03
Cadmium	<0.03	Iodine	0.007	Praseodymium	<0.03	Tin	<0.03
Calcium	1	Iridium	<0.03	Rhenium	<0.03	Titanium	0.08
Cerium	<0.03	Iron	0.8	Rhodium	<0.03	Tungsten	<0.03
Cesium	<0.03	Lanthanum	<0.03	Rubidium	<0.03	Uranium	<0.03
Chlorine	0.1	Lead	<0.03	Ruthenium	<0.03	Vanadium	≤0.001
Chromium	0.006	Lithium	0.004	Samarium	<0.03	Ytterbium	<0.03
Cobalt	0.002	Lutetium	<0.03	Scandium	≤0.008	Yttrium	<0.03
Copper	0.09	Magnesium	0.06	Selenium	0.02	Zinc	0.1
Dysprosium	<0.03	Manganese	0.009	Silicon	0.5	Zirconium	<0.03
Erbium	<0.03	Mercury	NR	Silver	<0.03		
Europium	<0.03	Molybdenum	0.03	Sodium	0.4		

STD - Internal Standard

NR - Not Reported

*Heterogeneous

TABLE C13. SSMS DATA FOR SAMPLE #5 (42:06)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.08	Fluorine	MC	Neodymium	<0.07	Strontium	0.1
Antimony	0.04	Gadolinium	<0.07	Nickel	0.08	Sulfur	MC
Arsenic	1	Gallium	<0.07	Niobium	<0.07	Tantalum	<0.07
Barium	0.5	Germanium	<0.07	Osmium	<0.07	Tellurium	≤0.03
Beryllium	<0.07	Gold	<0.07	Palladium	<0.07	Terbium	<0.07
Bismuth	<0.07	Hafnium	<0.07	Phosphorus	1	Thallium	<0.07
Boron	0.08	Holmium	<0.07	Platinum	<0.07	Thorium	<0.07
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.07
Cadmium	<0.07	Iodine	0.04	Praseodymium	<0.07	Tin	<0.07
Calcium	MC	Iridium	<0.07	Rhenium	<0.07	Titanium	0.1
Cerium	<0.07	Iron	1	Rhodium	<0.07	Tungsten	<0.07
Cesium	≤0.006	Lanthanum	<0.07	Rubidium	0.07	Uranium	0.3
Chlorine	3	Lead	<0.07	Ruthenium	<0.07	Vanadium	0.06
Chromium	0.02	Lithium	0.7	Samarium	<0.07	Ytterbium	<0.07
Cobalt	0.01	Lutetium	<0.07	Scandium	≤0.02	Yttrium	<0.07
Copper	0.1	Magnesium	MC	Selenium	0.1	Zinc	0.1
Dysprosium	<0.07	Manganese	0.04	Silicon	MC	Zirconium	<0.07
Erbium	<0.07	Mercury	NR	Silver	<0.07		
Europium	<0.07	Molybdenum	0.2	Sodium	MC		

STD - Internal Standard
NR - Not Reported
MC - Major Component - >10 μg/ml

TABLE C14. SSMS DATA FOR SAMPLE #6 (47:90)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.1	Fluorine	≈0.2	Neodymium	<0.04	Strontium	0.02
Antimony	<0.04	Gadolinium	<0.04	Nickel	0.04	Sulfur	0.9
Arsenic	0.01	Gallium	≤0.01	Niobium	<0.04	Tantalum	<0.04
Barium	0.03	Germanium	<0.04	Osmium	<0.04	Tellurium	<0.04
Beryllium	<0.04	Gold	<0.04	Palladium	<0.04	Terbium	<0.04
Bismuth	<0.04	Hafnium	<0.04	Phosphorus	0.2	Thallium	<0.04
Boron	0.001	Holmium	<0.04	Platinum	<0.04	Thorium	<0.04
Bromine	<0.04	Indium	STD	Potassium	0.7	Thulium	<0.04
Cadmium	<0.04	Iodine	<0.04	Praseodymium	<0.04	Tin	<0.04
Calcium	2	Iridium	<0.04	Rhenium	<0.04	Titanium	0.04
Cerium	<0.04	Iron	0.3	Rhodium	<0.04	Tungsten	<0.04
Cesium	<0.04	Lanthanum	<0.04	Rubidium	<0.04	Uranium	<0.04
Chlorine	0.02	Lead	<0.04	Ruthenium	<0.04	Vanadium	0.002
Chromium	≤0.003	Lithium	0.007	Samarium	<0.04	Ytterbium	<0.04
Cobalt	≤0.002	Lutetium	<0.04	Scandium	≤0.01	Yttrium	<0.04
Copper	0.2	Magnesium	0.1	Selenium	≤0.02	Zinc	0.2
Dysprosium	<0.04	Manganese	0.006	Silicon	4	Zirconium	≤0.03
Erbium	<0.04	Mercury	NR	Silver	<0.04		
Europium	<0.04	Molybdenum	≤0.03	Sodium	0.4		

STD - Internal Standard
NR - Not Reported

TABLE C15. SSMS DATA FOR SAMPLE #7 (50:76)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈1	Neodymium	<0.2	Strontium	0.03
Antimony	<0.2	Gadolinium	<0.2	Nickel	0.1	Sulfur	5
Arsenic	0.09	Gallium	≤0.03	Niobium	<0.2	Tantalum	<0.2
Barium	≤0.1	Germanium	<0.2	Osmium	<0.2	Tellurium	<0.2
Beryllium	<0.2	Gold	<0.2	Palladium	<0.2	Terbium	<0.2
Bismuth	<0.2	Hafnium	<0.2	Phosphorus	0.5	Thallium	<0.2
Boron	≤0.009	Holmium	<0.2	Platinum	<0.2	Thorium	<0.2
Bromine	<0.2	Indium	STD	Potassium	MC	Thulium	<0.2
Cadmium	<0.2	Iodine	<0.2	Praseodymium	<0.2	Tin	<0.2
Calcium	MC	Iridium	<0.2	Rhenium	<0.2	Titanium	0.1
Cerium	<0.2	Iron	0.5	Rhodium	<0.2	Tungsten	<0.2
Cesium	<0.2	Lanthanum	<0.2	Rubidium	≤0.008	Uranium	<0.2
Chlorine	0.2	Lead	<0.2	Ruthenium	<0.2	Vanadium	0.008
Chromium	0.02	Lithium	0.01	Samarium	<0.2	Ytterbium	<0.2
Cobalt	≤0.01	Lutetium	<0.2	Scandium	≤0.02	Yttrium	<0.2
Copper	0.6	Magnesium	0.2	Selenium	≤0.06	Zinc	0.6
Dysprosium	<0.2	Manganese	0.09	Silicon	MC	Zirconium	≤0.2
Erbium	<0.2	Mercury	NR	Silver	<0.2		
Europium	<0.2	Molybdenum	≤0.1	Sodium	2		

STD - Internal Standard
NR - Not Reported
MC - Major Component MC- >10 μg/ml

TABLE C16. SSMS DATA FOR SAMPLE #8 (54:33)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.05	Fluorine	≈0.2	Neodymium	<0.08	Strontium	0.02
Antimony	<0.08	Gadolinium	<0.08	Nickel	0.04	Sulfur	2
Arsenic	0.04	Gallium	≤0.02	Niobium	<0.08	Tantalum	<0.08
Barium	0.05	Germanium	<0.08	Osmium	<0.08	Tellurium	<0.08
Beryllium	<0.08	Gold	<0.08	Palladium	<0.08	Terbium	<0.08
Bismuth	<0.08	Hafnium	<0.08	Phosphorus	0.4	Thallium	<0.08
Boron	≤0.001	Holmium	<0.08	Platinum	<0.08	Thorium	<0.08
Bromine	≤0.04	Indium	STD	Potassium	*1	Thulium	<0.08
Cadmium	<0.08	Iodine	<0.08	Praseodymium	<0.08	Tin	<0.08
Calcium	2	Iridium	<0.08	Rhenium	<0.08	Titanium	0.07
Cerium	<0.08	Iron	3	Rhodium	<0.08	Tungsten	<0.08
Cesium	<0.08	Lanthanum	<0.08	Rubidium	<0.08	Uranium	<0.08
Chlorine	0.08	Lead	<0.08	Ruthenium	<0.08	Vanadium	≤0.004
Chromium	0.006	Lithium	*0.06	Samarium	<0.08	Ytterbium	<0.08
Cobalt	≤0.004	Lutetium	<0.08	Scandium	≤0.01	Yttrium	<0.08
Copper	0.2	Magnesium	≤0.2	Selenium	0.05	Zinc	0.06
Dysprosium	<0.08	Manganese	0.009	Silicon	*MC	Zirconium	≤0.06
Erbium	<0.08	Mercury	NR	Silver	<0.08		
Europium	<0.08	Molybdenum	0.06	Sodium	0.6		

STD - Internal Standard
NR - Not Reported
MC - Major Component MC- >10 μg/ml
*Heterogeneous

TABLE C17. SSMS DATA FOR SAMPLE #9 (57:84)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.007	Fluorine	≃0.2	Neodymium	<0.08	Strontium	0.02
Antimony	<0.08	Gadolinium	<0.08	Nickel	0.2	Sulfur	7
Arsenic	0.02	Gallium	<0.08	Niobium	<0.08	Tantalum	<0.08
Barium	0.05	Germanium	<0.08	Osmium	<0.08	Tellurium	<0.08
Beryllium	<0.08	Gold	<0.08	Palladium	<0.08	Terbium	<0.08
Bismuth	<0.08	Hafnium	<0.08	Phosphorus	0.2	Thallium	<0.08
Boron	0.004	Holmium	<0.08	Platinum	<0.08	Thorium	<0.08
Bromine	<0.08	Indium	STD	Potassium	0.6	Thulium	<0.08
Cadmium	<0.08	Iodine	<0.08	Praseodymium	<0.08	Tin	<0.08
Calcium	2	Iridium	<0.08	Rhenium	<0.08	Titanium	0.1
Cerium	<0.08	Iron	0.2	Rhodium	<0.08	Tungsten	<0.08
Cesium	<0.08	Lanthanum	<0.08	Rubidium	<0.08	Uranium	<0.08
Chlorine	0.2	Lead	<0.08	Ruthenium	<0.08	Vanadium	≤0.003
Chromium	0.2	Lithium	0.01	Samarium	<0.08	Ytterbium	<0.08
Cobalt	0.007	Lutetium	<0.08	Scandium	≤0.01	Yttrium	<0.08
Copper	0.3	Magnesium	0.2	Selenium	0.03	Zinc	0.1
Dysprosium	<0.08	Manganese	0.01	Silicon	3	Zirconium	≤0.06
Erbium	<0.08	Mercury	NR	Silver	<0.08		
Europium	<0.08	Molybdenum	0.06	Sodium	0.6		

STD - Internal Standard
NR - Not Reported

TABLE C18. SSMS DATA FOR SAMPLE #10 (61:43)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.007	Fluorine	≈0.1	Neodymium	<0.05	Strontium	≤0.006
Antimony	<0.05	Gadolinium	<0.05	Nickel	*0.3	Sulfur	4
Arsenic	0.02	Gallium	<0.05	Niobium	<0.05	Tantalum	<0.05
Barium	<0.05	Germanium	<0.05	Osmium	<0.05	Tellurium	<0.05
Beryllium	<0.05	Gold	<0.05	Palladium	<0.05	Terbium	<0.05
Bismuth	<0.05	Hafnium	<0.05	Phosphorus	0.3	Thallium	<0.05
Boron	0.004	Holmium	<0.05	Platinum	<0.05	Thorium	<0.05
Bromine	0.03	Indium	STD	Potassium	0.9	Thulium	<0.05
Cadmium	<0.05	Iodine	<0.05	Praseodymium	<0.05	Tin	<0.05
Calcium	1	Iridium	<0.05	Rhenium	<0.05	Titanium	0.04
Cerium	<0.05	Iron	0.2	Rhodium	<0.05	Tungsten	<0.05
Cesium	<0.05	Lanthanum	<0.05	Rubidium	<0.05	Uranium	<0.05
Chlorine	0.08	Lead	<0.05	Ruthenium	<0.05	Vanadium	0.003
Chromium	*0.08	Lithium	<0.001	Samarium	<0.05	Ytterbium	<0.05
Cobalt	0.09	Lutetium	<0.05	Scandium	0.004	Yttrium	<0.05
Copper	0.2	Magnesium	0.1	Selenium	<0.05	Zinc	0.08
Dysprosium	<0.05	Manganese	0.006	Silicon	1	Zirconium	<0.05
Erbium	<0.05	Mercury	NR	Silver	<0.05		
Europium	<0.05	Molybdenum	≤0.03	Sodium	0.2		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C19. SSMS DATA FOR SAMPLE #11 (65:76)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.02	Fluorine	≈0.04	Neodymium	<0.04	Strontium	0.009
Antimony	0.03	Gadolinium	<0.04	Nickel	0.04	Sulfur	1
Arsenic	0.02	Gallium	≤0.008	Niobium	<0.04	Tantalum	<0.04
Barium	≤0.04	Germanium	<0.04	Osmium	<0.04	Tellurium	<0.04
Beryllium	<0.04	Gold	<0.04	Palladium	<0.04	Terbium	<0.04
Bismuth	<0.04	Hafnium	<0.04	Phosphorus	0.08	Thallium	<0.04
Boron	0.003	Holmium	<0.04	Platinum	<0.04	Thorium	<0.04
Bromine	<0.04	Indium	STD	Potassium	0.7	Thulium	<0.04
Cadmium	*0.03	Iodine	<0.04	Praseodymium	<0.04	Tin	≤0.02
Calcium	2	Iridium	<0.04	Rhenium	<0.04	Titanium	≤0.08
Cerium	<0.04	Iron	0.1	Rhodium	<0.04	Tungsten	<0.04
Cesium	<0.04	Lanthanum	<0.04	Rubidium	<0.04	Uranium	0.08
Chlorine	0.1	Lead	<0.04	Ruthenium	<0.04	Vanadium	≤0.002
Chromium	*0.02	Lithium	<0.001	Samarium	<0.04	Ytterbium	<0.04
Cobalt	0.008	Lutetium	<0.04	Scandium	0.005	Yttrium	<0.04
Copper	0.06	Magnesium	≤0.1	Selenium	0.02	Zinc	0.02
Dysprosium	<0.04	Manganese	0.01	Silicon	2	Zirconium	≤0.02
Erbium	<0.04	Mercury	NR	Silver	<0.04		
Europium	<0.04	Molybdenum	0.05	Sodium	0.5		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C20. SSMS DATA FOR SAMPLE #12 (70:00)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.01	Fluorine	≈0.09	Neodymium	<0.1	Strontium	0.02
Antimony	<0.1	Gadolinium	<0.1	Nickel	*0.1	Sulfur	4
Arsenic	0.05	Gallium	≤0.02	Niobium	<0.1	Tantalum	<0.1
Barium	0.07	Germanium	<0.1	Osmium	<0.1	Tellurium	<0.1
Beryllium	<0.1	Gold	<0.1	Palladium	<0.1	Terbium	<0.1
Bismuth	<0.1	Hafnium	<0.1	Phosphorus	0.2	Thallium	<0.1
Boron	0.007	Holmium	<0.1	Platinum	<0.1	Thorium	<0.1
Bromine	<0.1	Indium	STD	Potassium	2	Thulium	<0.1
Cadmium	<0.1	Iodine	<0.1	Praseodymium	<0.1	Tin	<0.1
Calcium	2	Iridium	<0.1	Rhenium	<0.1	Titanium	0.07
Cerium	<0.1	Iron	*MC	Rhodium	<0.1	Tungsten	<0.1
Cesium	<0.1	Lanthanum	<0.1	Rubidium	<0.1	Uranium	<0.1
Chlorine	0.05	Lead	<0.1	Ruthenium	<0.1	Vanadium	0.008
Chromium	*0.1	Lithium	0.002	Samarium	<0.1	Ytterbium	<0.1
Cobalt	*0.07	Lutetium	<0.1	Scandium	≤0.01	Yttrium	<0.1
Copper	0.1	Magnesium	0.5	Selenium	0.04	Zinc	0.08
Dysprosium	<0.1	Manganese	*0.03	Silicon	2	Zirconium	<0.1
Erbium	<0.1	Mercury	NR	Silver	<0.1		
Europium	<0.1	Molybdenum	0.08	Sodium	0.3		

STD - Internal Standard
NR - Not Reported
MC - Major Component MC- >10 μg/ml
*Heterogeneous

TABLE C21. SSMS DATA FOR SAMPLE #13 (74:23)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.009	Fluorine	≈0.06	Neodymium	<0.03	Strontium	0.01
Antimony	<0.03	Gadolinium	<0.03	Nickel	0.07	Sulfur	5
Arsenic	0.06	Gallium	0.006	Niobium	<0.03	Tantalum	<0.03
Barium	0.08	Germanium	<0.03	Osmium	<0.03	Tellurium	<0.03
Beryllium	<0.03	Gold	<0.03	Palladium	<0.03	Terbium	<0.03
Bismuth	<0.03	Hafnium	<0.03	Phosphorus	0.3	Thallium	<0.03
Boron	0.007	Holmium	<0.03	Platinum	<0.03	Thorium	<0.03
Bromine	<0.03	Indium	STD	Potassium	1	Thulium	<0.03
Cadmium	<0.03	Iodine	<0.03	Praseodymium	<0.03	Tin	≤0.01
Calcium	1	Iridium	<0.03	Rhenium	<0.03	Titanium	≤0.04
Cerium	<0.03	Iron	0.4	Rhodium	<0.03	Tungsten	<0.03
Cesium	<0.03	Lanthanum	<0.03	Rubidium	<0.03	Uranium	<0.03
Chlorine	0.1	Lead	<0.03	Ruthenium	<0.03	Vanadium	≤0.001
Chromium	0.02	Lithium	<0.001	Samarium	<0.03	Ytterbium	<0.03
Cobalt	0.01	Lutetium	<0.03	Scandium	≤0.004	Yttrium	<0.03
Copper	0.2	Magnesium	0.1	Selenium	0.01	Zinc	0.1
Dysprosium	<0.03	Manganese	0.004	Silicon	1	Zirconium	<0.03
Erbium	<0.03	Mercury	NR	Silver	≤0.007		
Europium	<0.03	Molybdenum	0.03	Sodium	0.2		

STD - Internal Standard
NR - Not Reported

TABLE C22. SSMS DATA FOR SAMPLE #14 (74:23)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.02	Fluorine	≈0.04	Neodymium	<0.05	Strontium	0.01
Antimony	<0.05	Gadolinium	<0.05	Nickel	*0.1	Sulfur	MC
Arsenic	0.03	Gallium	0.01	Niobium	<0.05	Tantalum	<0.05
Barium	≤0.03	Germanium	<0.05	Osmium	<0.05	Tellurium	<0.05
Beryllium	<0.05	Gold	<0.05	Palladium	<0.05	Terbium	<0.05
Bismuth	<0.05	Hafnium	<0.05	Phosphorus	0.2	Thallium	<0.05
Boron	0.03	Holmium	<0.05	Platinum	<0.05	Thorium	<0.05
Bromine	<0.05	Indium	STD	Potassium	2	Thulium	<0.05
Cadmium	<0.05	Iodine	<0.05	Praseodymium	<0.05	Tin	<0.05
Calcium	2	Iridium	<0.05	Rhenium	<0.05	Titanium	≤0.04
Cerium	<0.05	Iron	0.2	Rhodium	<0.05	Tungsten	<0.05
Cesium	<0.05	Lanthanum	<0.05	Rubidium	<0.05	Uranium	<0.05
Chlorine	0.2	Lead	<0.05	Ruthenium	<0.05	Vanadium	0.002
Chromium	*0.04	Lithium	<0.001	Samarium	<0.05	Ytterbium	<0.05
Cobalt	*0.02	Lutetium	<0.05	Scandium	≤0.01	Yttrium	<0.05
Copper	0.04	Magnesium	≤0.1	Selenium	≤0.03	Zinc	0.07
Dysprosium	<0.05	Manganese	0.006	Silicon	1	Zirconium	≤0.04
Erbium	<0.05	Mercury	NR	Silver	<0.05		
Europium	<0.05	Molybdenum	≤0.03	Sodium	0.7		

STD - Internal Standard
NR - Not Reported
MC - Major Component

TABLE C23. SSMS DATA FOR SAMPLE #15 (76:38)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈0.08	Neodymium	<0.03	Strontium	0.008
Antimony	<0.03	Gadolinium	<0.03	Nickel	0.04	Sulfur	3
Arsenic	0.08	Gallium	≤0.007	Niobium	<0.03	Tantalum	<0.03
Barium	0.04	Germanium	<0.03	Osmium	<0.03	Tellurium	<0.03
Beryllium	<0.03	Gold	<0.03	Palladium	<0.03	Terbium	<0.03
Bismuth	<0.03	Hafnium	<0.03	Phosphorus	0.2	Thallium	<0.03
Boron	0.008	Holmium	<0.03	Platinum	<0.03	Thorium	<0.03
Bromine	≤0.02	Indium	STD	Potassium	1	Thulium	<0.03
Cadmium	≤0.01	Iodine	≤0.01	Praseodymium	<0.03	Tin	≤0.02
Calcium	2	Iridium	<0.03	Rhenium	<0.03	Titanium	≤0.05
Cerium	<0.03	Iron	0.5	Rhodium	<0.03	Tungsten	<0.03
Cesium	<0.03	Lanthanum	<0.03	Rubidium	<0.03	Uranium	<0.03
Chlorine	0.1	Lead	<0.03	Ruthenium	<0.03	Vanadium	≤0.002
Chromium	0.005	Lithium	<0.001	Samarium	<0.03	Ytterbium	<0.03
Cobalt	0.005	Lutetium	<0.03	Scandium	≤0.01	Yttrium	<0.03
Copper	0.3	Magnesium	≤0.08	Selenium	≤0.01	Zinc	0.1
Dysprosium	<0.03	Manganese	0.005	Silicon	1	Zirconium	≤0.01
Erbium	<0.03	Mercury	NR	Silver	<0.03		
Europium	<0.03	Molybdenum	0.03	Sodium	0.5		

STD - Internal Standard
NR - Not Reported

TABLE C24. SSMS DATA FOR SAMPLE #16 (76:38)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.02	Fluorine	≈0.01	Neodymium	<0.07	Strontium	0.02
Antimony	<0.07	Gadolinium	<0.07	Nickel	0.2	Sulfur	MC
Arsenic	0.2	Gallium	<0.07	Niobium	<0.07	Tantalum	<0.07
Barium	*0.09	Germanium	<0.07	Osmium	<0.07	Tellurium	<0.07
Beryllium	<0.07	Gold	<0.07	Palladium	<0.07	Terbium	<0.07
Bismuth	<0.07	Hafnium	<0.07	Phosphorus	0.2	Thallium	<0.07
Boron	≤0.001	Holmium	<0.07	Platinum	<0.07	Thorium	<0.07
Bromine	<0.07	Indium	STD	Potassium	3	Thulium	<0.07
Cadmium	<0.07	Iodine	<0.07	Praseodymium	<0.07	Tin	<0.07
Calcium	3	Iridium	<0.07	Rhenium	<0.07	Titanium	≤0.09
Cerium	<0.07	Iron	0.4	Rhodium	<0.07	Tungsten	<0.07
Cesium	<0.07	Lanthanum	<0.07	Rubidium	<0.07	Uranium	<0.07
Chlorine	0.5	Lead	<0.07	Ruthenium	<0.07	Vanadium	*0.006
Chromium	0.04	Lithium	0.003	Samarium	<0.07	Ytterbium	<0.07
Cobalt	0.06	Lutetium	<0.07	Scandium	0.02	Yttrium	<0.07
Copper	0.5	Magnesium	≤0.2	Selenium	*0.05	Zinc	0.08
Dysprosium	<0.07	Manganese	0.02	Silicon	*2	Zirconium	<0.07
Erbium	<0.07	Mercury	NR	Silver	<0.07		
Europium	<0.07	Molybdenum	0.09	Sodium	1		

STD - Internal Standard
NR - Not Reported
MC - Major Component
*Heterogeneous

TABLE C25. SSMS DATA FOR SAMPLE #17 (78:43)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.01	Fluorine	≈0.7	Neodymium	<0.04	Strontium	0.009
Antimony	<0.04	Gadolinium	<0.04	Nickel	0.02	Sulfur	3
Arsenic	0.006	Gallium	≤0.008	Niobium	<0.04	Tantalum	<0.04
Barium	0.03	Germanium	<0.04	Osmium	<0.04	Tellurium	<0.04
Beryllium	<0.04	Gold	<0.04	Palladium	<0.04	Terbium	<0.04
Bismuth	<0.04	Hafnium	<0.04	Phosphorus	0.1	Thallium	<0.04
Boron	0.01	Holmium	<0.04	Platinum	<0.04	Thorium	<0.04
Bromine	≤0.02	Indium	STD	Potassium	2	Thulium	<0.04
Cadmium	<0.04	Iodine	0.01	Praseodymium	<0.04	Tin	<0.04
Calcium	3	Iridium	<0.04	Rhenium	<0.04	Titanium	≤0.04
Cerium	<0.04	Iron	0.1	Rhodium	<0.04	Tungsten	<0.04
Cesium	<0.04	Lanthanum	<0.04	Rubidium	<0.04	Uranium	<0.04
Chlorine	0.3	Lead	<0.04	Ruthenium	<0.04	Vanadium	≤0.002
Chromium	0.005	Lithium	<0.001	Samarium	<0.04	Ytterbium	<0.04
Cobalt	0.002	Lutetium	<0.04	Scandium	≤0.006	Yttrium	<0.04
Copper	0.1	Magnesium	0.1	Selenium	0.03	Zinc	0.07
Dysprosium	<0.04	Manganese	0.005	Silicon	0.9	Zirconium	≤0.01
Erbium	<0.04	Mercury	NR	Silver	<0.04		
Europium	<0.04	Molybdenum	0.03	Sodium	0.3		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C26. SSMS DATA FOR SAMPLE #18 (78:43)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈0.2	Neodymium	<0.03	Strontium	0.008
Antimony	<0.03	Gadolinium	<0.03	Nickel	*0.06	Sulfur	3
Arsenic	0.05	Gallium	≤0.007	Niobium	<0.03	Tantalum	<0.03
Barium	0.02	Germanium	<0.03	Osmium	<0.03	Tellurium	≤0.02
Beryllium	<0.03	Gold	<0.03	Palladium	<0.03	Terbium	<0.03
Bismuth	<0.03	Hafnium	<0.03	Phosphorus	0.1	Thallium	<0.03
Boron	0.008	Holmium	<0.03	Platinum	<0.03	Thorium	<0.03
Bromine	<0.03	Indium	STD	Potassium	0.6	Thulium	<0.03
Cadmium	<0.03	Iodine	0.009	Praseodymium	<0.03	Tin	<0.03
Calcium	3	Iridium	<0.03	Rhenium	<0.03	Titanium	0.04
Cerium	<0.03	Iron	0.4	Rhodium	<0.03	Tungsten	<0.03
Cesium	<0.03	Lanthanum	<0.03	Rubidium	<0.03	Uranium	<0.03
Chlorine	0.1	Lead	<0.03	Ruthenium	<0.03	Vanadium	≤0.002
Chromium	*0.08	Lithium	<0.001	Samarium	<0.03	Ytterbium	<0.03
Cobalt	0.03	Lutetium	<0.03	Scandium	≤0.005	Yttrium	<0.03
Copper	0.1	Magnesium	0.1	Selenium	0.02	Zinc	0.04
Dysprosium	<0.03	Manganese	0.01	Silicon	2	Zirconium	≤0.03
Erbium	<0.03	Mercury	NR	Silver	<0.03		
Europium	<0.03	Molybdenum	0.03	Sodium	0.5		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C27. SSMS DATA FOR SAMPLE #19 (80:15)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.006	Fluorine	≈1	Neodymium	<0.02	Strontium	0.009
Antimony	<0.02	Gadolinium	<0.02	Nickel	*0.04	Sulfur	3
Arsenic	≤0.02	Gallium	<0.02	Niobium	<0.02	Tantalum	<0.02
Barium	0.01	Germanium	<0.02	Osmium	<0.02	Tellurium	<0.02
Beryllium	<0.02	Gold	<0.02	Palladium	<0.02	Terbium	<0.02
Bismuth	<0.02	Hafnium	<0.02	Phosphorus	0.08	Thallium	<0.02
Boron	≤0.001	Holmium	<0.02	Platinum	<0.02	Thorium	<0.02
Bromine	<0.02	Indium	STD	Potassium	0.7	Thulium	<0.02
Cadmium	<0.02	Iodine	<0.02	Praseodymium	<0.02	Tin	<0.02
Calcium	0.7	Iridium	<0.02	Rhenium	<0.02	Titanium	0.02
Cerium	<0.02	Iron	0.07	Rhodium	<0.02	Tungsten	<0.02
Cesium	<0.02	Lanthanum	<0.02	Rubidium	<0.02	Uranium	≤0.03
Chlorine	0.3	Lead	<0.02	Ruthenium	<0.02	Vanadium	<0.001
Chromium	*0.01	Lithium	<0.001	Samarium	<0.02	Ytterbium	<0.02
Cobalt	*0.007	Lutetium	<0.02	Scandium	≤0.003	Yttrium	<0.02
Copper	0.1	Magnesium	≤0.04	Selenium	<0.02	Zinc	0.03
Dysprosium	<0.02	Manganese	0.006	Silicon	7	Zirconium	<0.02
Erbium	<0.02	Mercury	NR	Silver	<0.02		
Europium	<0.02	Molybdenum	0.01	Sodium	0.2		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C28. SSMS DATA FOR SAMPLE #20 (82:45)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.008	Fluorine	≈0.3	Neodymium	<0.01	Strontium	0.007
Antimony	<0.01	Gadolinium	<0.01	Nickel	0.04	Sulfur	3
Arsenic	0.02	Gallium	≤0.001	Niobium	<0.01	Tantalum	<0.01
Barium	0.01	Germanium	<0.01	Osmium	<0.01	Tellurium	<0.01
Beryllium	<0.01	Gold	<0.01	Palladium	<0.01	Terbium	<0.01
Bismuth	<0.01	Hafnium	<0.01	Phosphorus	0.1	Thallium	<0.01
Boron	0.003	Holmium	<0.01	Platinum	<0.01	Thorium	<0.01
Bromine	<0.01	Indium	STD	Potassium	0.9	Thulium	<0.01
Cadmium	<0.01	Iodine	0.004	Praseodymium	<0.01	Tin	<0.01
Calcium	1	Iridium	<0.01	Rhenium	<0.01	Titanium	*0.04
Cerium	<0.01	Iron	0.09	Rhodium	<0.01	Tungsten	<0.01
Cesium	<0.01	Lanthanum	<0.01	Rubidium	<0.01	Uranium	<0.01
Chlorine	0.2	Lead	<0.01	Ruthenium	<0.01	Vanadium	0.003
Chromium	0.01	Lithium	<0.001	Samarium	<0.01	Ytterbium	<0.01
Cobalt	*0.006	Lutetium	<0.01	Scandium	≤0.004	Yttrium	<0.01
Copper	0.05	Magnesium	≤0.03	Selenium	0.02	Zinc	0.02
Dysprosium	<0.01	Manganese	0.007	Silicon	3	Zirconium	<0.01
Erbium	<0.01	Mercury	NR	Silver	<0.01		
Europium	<0.01	Molybdenum	≤0.01	Sodium	0.5		

STD - Internal Standard
NR - Not Reported
*Heterogeneous

TABLE C29. SSMS DATA FOR SAMPLE #21 (85:76)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈0.6	Neodymium	<0.01	Strontium	0.01
Antimony	<0.01	Gadolinium	<0.01	Nickel	0.04	Sulfur	8
Arsenic	0.02	Gallium	<0.01	Niobium	<0.01	Tantalum	<0.01
Barium	0.01	Germanium	<0.01	Osmium	<0.01	Tellurium	<0.01
Beryllium	<0.01	Gold	<0.01	Palladium	<0.01	Terbium	<0.01
Bismuth	<0.01	Hafnium	<0.01	Phosphorus	0.1	Thallium	<0.01
Boron	0.004	Holmium	<0.01	Platinum	<0.01	Thorium	<0.01
Bromine	<0.01	Indium	STD	Potassium	1	Thulium	<0.01
Cadmium	<0.01	Iodine	≤0.04	Praseodymium	<0.01	Tin	<0.01
Calcium	3	Iridium	<0.01	Rhenium	<0.01	Titanium	0.05
Cerium	<0.01	Iron	0.2	Rhodium	<0.01	Tungsten	<0.01
Cesium	<0.01	Lanthanum	<0.01	Rubidium	<0.01	Uranium	≤0.3
Chlorine	0.2	Lead	0.02	Ruthenium	<0.01	Vanadium	0.001
Chromium	0.01	Lithium	<0.001	Samarium	<0.01	Ytterbium	<0.01
Cobalt	0.003	Lutetium	<0.01	Scandium	≤0.004	Yttrium	<0.01
Copper	0.2	Magnesium	0.04	Selenium	0.02	Zinc	0.05
Dysprosium	<0.01	Manganese	0.008	Silicon	1	Zirconium	<0.01
Erbium	<0.01	Mercury	NR	Silver	<0.01		
Europium	<0.01	Molybdenum	0.02	Sodium	0.5		

STD - Internal Standard
NR - Not Reported

TABLE C30. SSMS DATA FOR SAMPLE #22 (88:75)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.008	Fluorine	≃0.2	Neodymium	<0.01	Strontium	0.02
Antimony	<0.01	Gadolinium	<0.01	Nickel	0.06	Sulfur	2
Arsenic	0.04	Gallium	<0.01	Niobium	<0.01	Tantalum	<0.01
Barium	0.02	Germanium	<0.01	Osmium	<0.01	Tellurium	<0.01
Beryllium	<0.01	Gold	<0.01	Palladium	<0.01	Terbium	<0.01
Bismuth	<0.01	Hafnium	<0.01	Phosphorus	0.09	Thallium	<0.01
Boron	0.004	Holmium	<0.01	Platinum	<0.01	Thorium	<0.01
Bromine	0.004	Indium	STD	Potassium	0.3	Thulium	<0.01
Cadmium	<0.01	Iodine	≤0.009	Praseodymium	<0.01	Tin	<0.01
Calcium	0.7	Iridium	<0.01	Rhenium	<0.01	Titanium	0.005
Cerium	<0.01	Iron	0.1	Rhodium	<0.01	Tungsten	<0.01
Cesium	<0.01	Lanthanum	<0.01	Rubidium	<0.01	Uranium	<0.01
Chlorine	0.09	Lead	0.01	Ruthenium	<0.01	Vanadium	0.002
Chromium	≤0.002	Lithium	<0.001	Samarium	<0.01	Ytterbium	<0.01
Cobalt	<0.001	Lutetium	<0.01	Scandium	≤0.001	Yttrium	<0.01
Copper	0.03	Magnesium	0.09	Selenium	0.005	Zinc	0.01
Dysprosium	<0.01	Manganese	0.004	Silicon	0.6	Zirconium	<0.01
Erbium	<0.01	Mercury	NR	Silver	<0.01		
Europium	<0.01	Molybdenum	0.006	Sodium	0.1		

STD -Internal Standard
NR - Not Reported

TABLE C31. PARAHOE MINE DUST CONTROL WATER A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE C32. PARAHOE MINE DUST CONTROL WATER B-N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.38	air spike	

*Relative to the internal standard D-10 Anthracene.

TABLE C33. PARAHOE WELL #4 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.17	unknown	
1.18	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE C34. PARAHOE WELL #4 B-N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	trimethylpyridine isomer	∿240
0.36	2,4-dimethyl-6-ethylpyridine (tentative)	NQ
0.38	2,6-dimethyl-4-ethylpyridine (tentative)	NQ
0.41	unknown	
0.44	$C_9H_{11}NO$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE C35. PARAHOE INDUSTRIAL POND A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.22	unknown	
0.23	unknown	
0.27	n-butyric acid	67
0.31	unknown	
0.32	unknown	
0.33	unknown	
0.38	$C_5H_{10}0_2$ acid isomer	23
0.38	unknown	
0.40	unknown	
0.45	unknown	
0.48	unknown	
0.52	unknown	
0.53	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE C36. PARAHOE INDUSTRIAL POND B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.16	unknown	
0.18	C_8H_{14} isomer (tentative)	NQ
0.20	unknown	
0.23	C_8H_{14} isomer (tentative)	NQ
0.24	$C_8H_{12}O$ isomer	NQ
0.25	C_6H_8O isomer (tentative)	NQ
0.27	unknown	
0.27	C_8H_{14} isomer (tentative)	NQ
0.28	C_8H_{14} isomer (tentative)	NQ
0.29	trimethylpyridine isomer	$\sim$110
0.30	unknown	
0.31	C_8H_{14} isomer (tentative)	NQ
0.32	$C_8H_{12}O$ isomer	NQ
0.33	unknown	
0.33	unknown	
0.34	$C_7H_{10}O$ isomer (tentative)	NQ
0.35	unknown	
0.36	unknown	
0.37	2,4-dimethyl-6-ethylpyridine (tentative)	NQ
0.38	$C_9H_{14}O$ isomer (tentative)	NQ
0.38	$C_9H_{14}O$ isomer (tentative)	NQ
0.39	unknown	
0.40	$C_8H_{12}O$ isomer	NQ
0.41	$C_9H_{14}O$ isomer	NQ
0.41	isophorone	65
0.42	unknown	
0.44	unknown	
0.44	unknown	
0.45	unknown	
0.48	unknown	
0.48	unknown	
0.49	unknown	
0.51	unknown	
0.51	unknown	
0.52	unknown	
0.54	unknown	
0.56	unknown	
0.57	unknown	
0.59	$C_{10}H_9N$ isomer (tentative)	NQ
0.60	unknown	
0.61	unknown	
0.64	unknown	
0.66	unknown	
0.68	unknown	
0.68	unknown	

(Continued)

TABLE C36. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.70	unknown	
0.72	dimethylquinoline isomer	∿4
0.73	unknown	
0.77	unknown	
0.81	unknown	
0.84	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE C37. PARAHOE RECYCLE GAS CONDENSATE A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.24	unknown	
0.26	unknown	
0.27	unknown	
0.29	phenol	4400
0.33	unknown	
0.36	unknown	
0.37	unknown	
0.44	unknown	
0.44	unknown	
0.97	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE C38. PARAHOE RECYCLE GAS CONDENSATE B-N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylpyridine isomer (tentative)	NQ
0.19	dimethylpyridine isomer	∼28000
0.23	dimethylpyridine isomer	∼23000
0.29	trimethylpyridine isomer	>100000
0.31	$C_8H_{11}N$ isomer (tentative)	NQ
0.37	2,4 dimethyl-6-ethylpyridine	NQ
0.41	unknown	
1.00	D-10 ANTHRACENE	IS
1.19	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE C39. PARAHOE PROCESS WATER TK522A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.16	isobutyric acid	95
0.20	unknown	
0.24	dimethyltetrahydrofuran (tentative)	NQ
0.27	unknown	
0.29	phenol	250
0.31	$C_4H_8O_2$ acid isomer	∼1800
0.34	unknown	
0.35	unknown	
0.39	unknown	
0.40	$C_5H_{10}O_2$ acid isomer	∼1400
0.42	unknown	
0.43	unknown	
0.49	$C_6H_{12}O_2$ acid isomer	∼16000
0.50	unknown	
0.52	∼C_8 ester isomer (tentative)	NQ
0.57	$C_8H_{16}O_2$ acid isomer	∼17000
0.64	n-nonanoic acid	3700
0.71	$C_{10}H_{20}O_2$ acid isomer	∼1500
1.00	D-10 ANTHRACENE	IS
1.10	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE C40. PARAHOE PROCESS WATER TK522 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylpyridine isomer (tentative)	NQ
0.17	methylpyridine isomer (tentative)	NQ
0.19	dimethylpyridine isomer	~840
0.23	dimethylpyridine isomer	~2400
0.24	dimethylpyridine isomer	~1100
0.26	methylethylpyridine isomer	~13
0.27	benzonitrile	450
0.27	methylpyridine isomer (tentative)	NQ
0.28	unknown	
0.29	trimethylpyridine isomer	~2900
0.30	C_8H_{16} isomer (tentative)	AS
0.31	trimethylpyridine isomer	~490
0.31	trimethylpyridine isomer + unknown	~170
0.32	phenol	770
0.33	C_8H_{14} isomer	NQ
0.36	unknown	
0.36	C_3 alkylpyridine isomer	~520
0.37	2,4-dimethyl-6-ethylpyridine	NQ
0.38	$C_8H_{12}O$ isomer (tentative)	NQ
0.38	$C_8H_{11}N$ isomer	~1200
0.39	unknown	
0.40	unknown	
0.41	isophorone	570
0.42	n-undecane	57
0.42	unknown	
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	unknown	
0.50	2,3-dimethylphenol	~210
0.51	unknown	
0.52	n-dodecane	48
0.53	unknown	
0.56	$C_9H_{17}N$ isomer	NQ
0.59	unknown	
0.60	unknown	
0.62	n-tridecane	82
0.65	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE C41. PARAHOE PRODUCT WATER TK500 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.41	unknown	
0.42	n-undecane	3200
0.51	unknown	
0.52	n-dodecane	3000
0.53	unknown	
0.60	unknown alkene	
0.61	n-tridecane	3600
0.65	unknown	
0.69	unknown alkane	
0.70	unknown	
0.71	n-tetradecane	3300
0.77	unknown alkane	
0.79	unknown	
0.80	n-pentadecane	7700
0.87	unknown	
0.88	n-hexadecane	8400
0.92	unknown alkane	
0.95	unknown	
0.96	n-heptadecane	12000
0.97	unknown alkane	
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.03	unknown	
1.04	n-octadecane	5000
1.05	unknown alkane	
1.11	unknown	
1.11	n-nonadecane	3500
1.17	unknown	
1.18	n-eicosane	2600
1.24	unknown	
1.25	n-heneicosane	3500
1.30	unknown	
1.31	n-docosane	2700
1.37	n-tricosane	2400
1.43	n-tetracosane	1900
1.49	n-pentacosane	3000
1.56	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE C42. PARAHOE PRODUCT WATER TK500 B-N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.40	unknown	
0.42	undecane	1600
0.51	unknown	
0.52	n-dodecane	5100
0.53	unknown	
0.59	unknown	
0.60	unknown	
0.61	n-tridecane	3900
0.65	unknown	
0.69	$C_{14}H_{30}$ isomer	2400
0.69	unknown	
0.71	n-tetradecane	1800
0.76	unknown	
0.77	$C_{15}H_{32}$ isomer	7000
0.79	unknown	
0.80	n-pentadecane	6700
0.87	unknown	
0.88	n-hexadecane	7700
0.92	$C_{17}H_{36}$ isomer	5800
0.95	unknown	
0.96	n-heptadecane	8900
0.97	$C_{18}H_{38}$ isomer	4200
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.03	unknown	
1.04	n-octadecane (tentative)	4200
1.05	unknown	
1.11	unknown	
1.11	nonadecane	3600
1.17	unknown	
1.18	n-eicosane	2700
1.24	unknown	
1.25	heneicosane	3300
1.30	unknown	
1.31	n-docasane	3500
1.37	unknown	
1.37	n-tricosane	3200
1.43	unknown	
1.43	n-tetracosane	2900
1.48	unknown	
1.49	n-pentacosane	2700
1.56	unknown	
1.63	unknown	
1.73	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE C43. LAWRENCE LIVERMORE SAMPLE #1(26:15) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.20	acetonitrile	72000
0.31	acetone	39000
0.34	carbon disulfide	69
0.36	propanenitrile (tentative)	NQ
0.59	2-butanone	>100000
0.65	unknown	
0.73	thiophene	99
0.78	methyl isopropyl ketone	10000
0.83	dihydropyran	1600
0.92	2-pentanone	24000
0.95	benzene	430
1.00	1,2-DIBROMOETHANE	IS
1.03	unknown	
1.07	2-methylthiacyclopentane (tentative)	NQ
1.10	3-methylcyclopentanone	>100000
1.15	2-methylpyrrole (tentative)	NQ
1.21	3-methylthiophene	570
1.26	C_7H_{16} isomer	2700
1.30	2-hexanone	12000
1.39	unknown	
1.45	toluene	2200
1.47	trimethylcyclohexene isomer (tentative)	NQ
1.57	2,5-dimethylpyrrole	5700
1.59	1,1,3-trimethylcyclohexane (tentative)	NQ
1.67	ethylbenzene	480
1.68	2,4-dimethylthiophene (tentative)	NQ
1.84	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.88	unknown	
1.91	m- and/or p-xylene	1800
1.94	o-xylene	1400
2.11	unknown	
2.18	ethyltoluene isomer	400
2.22	C_9H_{20} isomer unknown aromatic compound	>100000

*Relative to the internal standard 1,2-dibromoethane.

TABLE C44. LAWRENCE LIVERMORE SAMPLE #2(30:40) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.20	acetonitrile	83000
0.31	acetone	49000
0.36	propanenitrile (tentative)	NQ
0.59	2-butanone	76000
0.78	methyl isopropyl ketone	6900
0.83	dihydropyran	220
0.92	2-pentanone	15000
0.95	benzene	270
1.00	1,2-DIBROMOETHANE	IS
1.05	unknown	
1.13	3-methylcyclopentanone	>100000
1.18	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	230
1.29	C_7H_{16} isomer	4600
1.33	2-hexanone	6400
1.42	3-methylpyridine	50000
1.45	unknown	
1.48	toluene	1100
1.59	2,5-dimethylpyrrole	10000
1.63	trimethylcyclohexane (tentative)	NQ
1.69	2-heptanone	6200
1.72	2,5-dimethylthiophene (tentative)	NQ
1.81	3,5-dimethylpyridine	>100000
1.84	unknown	
1.88	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.93	m- and/or p-xylene	1200
1.98	o-xylene	950
2.01	2,3,4-trimethylthiophene (tentative)	NQ
2.03	unknown	
2.06	2-octanone	2100
2.16	unknown	
2.24	ethyltoluene isomer	270
2.28	C_9H_{20} isomer	>100000

*Relative to the internal standard 1,2-dibromoethane.

TABLE C45. LAWRENCE LIVERMORE SAMPLE #3(34:00) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.20	acetonitrile	57000
0.31	acetone	37000
0.36	propanenitrile (tentative)	NQ
0.59	2-butanone	81000
0.67	3-butenenitrile (tentative)	NQ
0.75	thiophene	160
0.81	methyl isopropyl ketone	8400
0.86	dihydropyran	1200
0.95	2-pentanone	14000
0.98	benzene	1500
1.00	1,2-DIBROMOETHANE	IS
1.05	unknown	
1.11	2-methylthiacyclopentane (tentative)	NQ
1.14	3-methylcyclopentanone	>100000
1.19	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	330
1.31	C_7H_{16} isomer	13000
1.34	2-hexanone	7600
1.43	2-methylpyridine	27000
1.47	unknown	
1.50	toluene	2300
1.61	2,5-dimethylpyrrole	4800
1.72	ethylbenzene	210
1.74	2,5-dimethylthiophene (tentative)	NQ
1.79	dimethylthiophene isomer (tentative)	NQ
1.82	3,5-dimethylpyridine	>100000
1.85	benzonitrile	2100
1.91	2,6-dimethylpyridine	>100000
1.97	m- and/or p-xylene	980
2.00	o-xylene	720
2.03	2-methyl-6-ethylpyridine	11000
2.08	2-octanone	2100
2.14	unknown	
2.18	unknown	
2.20	indan (tentative)	NQ
2.26	ethyltoluene isomer	350
2.31	C_9H_{20} isomer	>100000

*Relative to the internal standard 1,2-dibromoethane.

TABLE C46. LAWRENCE LIVERMORE SAMPLE #4(37:25) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.20	acetonitrile	94000
0.27	methylene chloride	59
0.31	acetone	50000
0.36	propanenitrile (tentative)	NQ
0.56	2-methylpropanenitrile (tentative)	NQ
0.59	2-butanone	67000
0.74	thiophene	120
0.81	methyl isopropyl ketone	5400
0.86	dihydropyran	620
0.90	unknown	
0.95	3-pentanone	25000
0.97	benzene	2400
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.19	2-methylpyrrole (tentative)	NQ
1.26	3-methylthiophene	68
1.32	unknown	
1.36	2-hexanone	4900
1.42	1,1-dimethycyclohexane (tentative)	NQ
1.50	toluene	1500
1.61	2,5-dimethylpyrrole	2600
1.66	1,1,2-trimethylcyclohexane (tentative)	NQ
1.68	2-ethylpyridine (tentative)	NQ
1.71	unknown	
1.73	ethylbenzene	360
1.81	1,trans-2,cis-3-trimethylcyclopentane (tentative)	NQ
1.85	2,4-dimethylpyridine	>100000
1.88	n-octane	7100
1.91	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.97	styrene	150
1.99	m- and/or p-xylene	1100
2.02	o-xylene	930
2.04	air spike	
2.05	2-acetylthiophene (tentative)	NQ
2.07	unknown	
2.11	2-octanone	1400
2.16	unknown	
2.22	ethyltoluene isomer	230
2.27	o-ethyltoluene	130
2.31	column artifact	
2.39	$C_9H_{10}O$ isomer (tentative)	NQ
2.44	unknown + column artifact	
2.47	unknown + column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C47. LAWRENCE LIVERMORE SAMPLE #5 (42:06) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.20	acetonitrile	13000
0.27	methylene chloride	33
0.31	acetone	10000
0.59	2-butanone	4700
0.97	benzene	57
1.00	1,2-DIBROMOETHANE	IS
1.50	toluene	76
1.66	1,1,3-trimethylcyclohexane (tentative)	NQ
1.73	ethylbenzene	45
1.78	unknown	
1.85	column artifact	
1.91	unknown	
1.98	m- and/or p-xylene	210
2.03	o-xylene	210
2.19	unknown + column artifact	
2.29	column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C48. LAWRENCE LIVERMORE SAMPLE #6(47:90) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	air	
0.18	acetonitrile	>100000
0.25	methylene chloride	260
0.30	acetone	21000
0.34	propanenitrile (tentative)	NQ
0.58	2-butanone	50000
0.73	thiophene	150
0.79	methyl isopropyl ketone	4100
0.84	dihydropyran	1100
0.94	2-pentanone	10000
0.96	benzene	1000
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.13	methylcyclohexane	220
1.21	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	580
1.29	unknown	
1.33	2-hexanone	6400
1.44	2-methylpyridine	8600
1.48	toluene	2500
1.52	unknown	
1.56	unknown	
1.61	dimethylpyrrole	2800
1.65	1,1,2-trimethylcyclohexane (tentative)	NQ
1.68	3-heptanone	880
1.72	ethylbenzene	1100
1.73	2,4-dimethylthiophene (tentative)	NQ
1.78	trimethylcyclopentane (tentative)	NQ
1.86	n-octane	8600
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.92	air spike	
1.96	m- and/or p-xylene	770
2.01	o-xylene	550
2.02	2-acetylthiophene (tentative)	NQ
2.08	2-octanone	2000
2.17	tetramethylcyclopentane (tentative)	NQ
2.20	C_9H_{12} isomer	3000
2.23	t-butylthiophene (tentative)	NQ
2.25	o-ethyltoluene	270
2.27	n-nonane	>100000
2.35	column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C49. LAWRENCE LIVERMORE SAMPLE #7(50:76) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	unknown	
0.49	2-butanone	6900
0.81	methyl isopropyl ketone	1800
0.92	2-pentanone	640
0.98	benzene	260
1.00	1.2-DIBROMOETHANE	IS
1.10	2-methylthiacyclopentane (tentative)	NQ
1.21	2-methylpyrrole (tentative)	NQ
1.26	3-methylthiophene	200
1.34	column artifact	
1.36	column artifact	
1.37	2-hexanone	4900
	air	
1.42	$C_6H_{12}O$ isomer	4700
1.49	unknown	
1.52	toluene	390
1.55	unknown	
1.65	2,5-dimethylpyrrole	1500
1.67	1,1,3-trimethylcyclohexane (tentative)	NQ
1.75	ethylbenzene	100
1.77	2,5-dimethylthiophene (tentative)	NQ
1.82	dimethylthiophene isomer (tentative)	NQ
1.86	2,4-dimethylpyridine	>100000
	column artifact	
1.90	unknown + column artifact	
1.92	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative	NQ
1.99	m- and/or p-xylene	240
2.04	o-xylene	250
2.06	2-acetylthiophene	NQ
2.08	unknown	
2.14	2-octanone	970
2.23	C_9H_{10} isomer (tentative	NQ
2.29	o-ethyl toluene	170
2.40	p-isopropyltoluene (tentative)	NQ
	column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C50. LAWRENCE LIVERMORE SAMPLE #8(54:33) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	>100000
0.27	methylene chloride	38
0.31	acetone	8200
0.36	carbon disulfide	19
0.37	propanenitrile (tentative)	NQ
0.57	2-methylpropanenitrile (tentative)	NQ
0.60	2-butanone	82000
0.67	unknown	
0.74	thiophene	44
0.81	methyl isopropyl ketone	6500
0.88	dihydropyran	550
0.98	benzene	350
1.00	1,2-DIBROMOETHANE	IS
1.10	2-methylthiacyclopentane (tentative)	NQ
1.13	methylcyclohexane	100
1.20	2-methylpyrrole (tentative)	NQ
1.23	unknown	
1.25	2-methylthiophene	260
1.34	4-methylcyclohexene (tentative)	NQ
1.39	unknown	
1.46	unknown	
1.49	toluene	810
1.57	unknown	
1.60	C_9H_{16} isomer (tentative)	NQ
1.63	1,1,3-trimethylcyclohexane (tentative)	NQ
1.70	3,5,5-trimethylcyclohexene (tentative)	NQ
1.71	ethylbenzene	530
1.73	2,5-dimethylthiophene (tentative)	NQ
1.77	1,trans-2,cis-3-trimethylcyclopentane (tentative)	NQ
1.82	unknown + column artifact	
1.86	n-octane	60000
1.88	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.92	unknown	
1.96	m- and/or p-xylene	1400
	unknown	
1.99	o-xylene	1100
2.04	n-propylbenzene	200
2.07	2-octanone	9000
2.12	unknown	
2.16	C_9H_{18} isomer	>100000
2.19	isopropylbenzene	14000
2.23	o-ethyltoluene	1500
	unknown	
2.27	n-nonane	>100000

(Continued)

TABLE C50. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
2.34	tetramethylbenzene (tentative)	NQ
2.39	$C_{10}H_{20}$ isomer (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C51. LAWRENCE LIVERMORE SAMPLE #9(57:84) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	air	
0.21	acetonitrile	>100000
0.31	acetone	>100000
0.36	propanenitrile (tentative)	NQ
0.57	2-methylpropanenitrile (tentative)	NQ
0.60	2-butanone	>100000
0.67	butanenitrile (tentative)	NQ
0.75	thiophene	61
0.81	pyrrole (tentative)	NQ
	methyl isopropyl ketone	11000
0.85	dihydropyran	3000
0.95	2-pentanone	17000
0.98	benzene	600
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.20	2-methylpyrrole (tentataive)	NQ
1.24	3-methylthiophene	15
1.26	2-methylthiophene	220
1.41	4-methyl-2-pentanone	4000
1.48	unknown	
1.51	toluene	630
1.55	C_6H_8S isomer (tentative)	NQ
1.61	cycloheptanone (tentative)	NQ
1.64	2,4-dimethylpyrrole	3900
1.67	2,5-dimethylpyrrole	1400
1.77	2,4-dimethylthiophene (tentative)	NQ
1.82	2,5-dimethylthiophene (tentative)	NQ
1.86	2,4-dimethylpyridine	>100000
	column artifact	
1.92	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.98	benzonitrile	310
2.00	m- and/or p-xylene	310
2.04	o-xylene	370
2.07	unknown	
2.14	2-octanone	1300
2.24	unknown	
2.29	o-ethyltoluene	140
2.42	trimethylpyridine (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C52. LAWRENCE LIVERMORE SAMPLE #10(61:43) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.14	methanol	>100000
0.20	acetonitrile	>100000
0.27	methylene chloride	780
0.31	acetone	76000
0.36	propanenitrile (tentative)	NQ
0.56	methylpropanenitrile (tentative)	NQ
0.60	2-butanone	>100000
0.66	butanenitrile (tentative)	NQ
0.74	thiophene	47
0.81	methyl isopropyl ketone	9400
0.86	dihydropyran	1000
0.95	3-pentanone	12000
0.97	benzene	370
1.00	1,2-DIBROMOETHANE	IS
1.09	n-hexane	3500
1.13	methylcyclohexane	140
1.19	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	330
1.36	1-methylcyclohexene (tentative)	NQ
1.41	1,cis-2-dimethylcyclohexane (tentative)	NQ
1.47	C_6H_8 isomer (tentative)	NQ
1.49	toluene	990
1.51	$C_8H_{12}O$ isomer (tentative)	NQ
1.61	unknown	
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	660
1.74	2,5-dimethylthiophene (tentative)	NQ
1.76	C_8H_{18} isomer	20000
1.79	trimethylcyclopentane (tentative)	NQ
1.84	tetramethyl-trans-3-hexene (tentative)	NQ
1.87	n-octane	78000
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.93	unknown	
1.97	m- and/or p-xylene	1400
1.99	unknown	
2.01	o-xylene	1300
2.03	2-acetylthiophene (tentative)	NQ
2.06	n-propylbenzene	290
2.11	unknown	
2.18	C_9H_{18} isomer	>100000
2.21	o-ethyltoluene	830
2.25	2-methyl-3-ethylheptane (tentative)	NQ

(continued)

TABLE C52. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
2.30	n-nonane	>100000
2.38	dimethylethylbenzene (tentative)	NQ
2.42	diethylcyclohexane (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C53. LAWRENCE LIVERMORE SAMPLE #11(65:76) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.14	methanol	>100000
0.20	acetonitrile	77000
0.27	methylene chloride	560
0.31	acetone	47000
0.36	carbon disulfide	17
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	48000
0.74	thiophene	65
0.81	pyrrole (tentative)	NQ
0.82	methyl isopropyl ketone	3500
0.86	dihydropyran	400
0.97	benzene	610
1.00	1,2-DIBROMOETHANE	IS
1.09	n-hexane	1500
1.19	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	290
1.49	toluene	740
1.57	unknown	
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.73	ethylbenzene	180
1.74	2,4-dimethylthiophene (tentative)	NQ
1.76	dimethylthiophene isomer (tentative)	NQ
1.79	trimethylcyclopentane (tentative)	NQ
1.81	2,4-dimethylpyridine column artifact	>100000
1.87	n-octane	19000
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.97	m- and/or p-xylene	470
2.01	o-xylene	360
2.03	2-acetylthiophene (tentative)	NQ
2.06	n-propylbenzene	67
2.11	unknown	
2.18	C_9H_{18} isomer	>100000
2.20	C_9H_{12} isomer	180
2.22	t-butylthiophene (tentative)	NQ
2.25	o-ethyltoluene	370
2.35	n-nonane	>100000

*Relative to the internal standard 1,2-dibromoethane.

TABLE C54. LAWRENCE LIVERMORE SAMPLE #12(70:00) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.18	methanol	>100000
0.21	acetonitrile	>100000
0.27	methylene chloride	380
0.31	acetone	67000
0.34	carbon disulfide	23
0.36	propanenitrile (tentative)	NQ
0.53	cyclopentadiene (tentative)	NQ
0.56	2-methylpropanenitrile (tentative)	NQ
0.60	2-butanone	73000
0.66	butanenitrile (tentative)	NQ
0.74	thiophene	140
0.81	methyl isopropyl ketone	2900
0.88	dihydropyran	130
0.97	benzene	1300
1.00	1,2-DIBROMETHANE	IS
1.10	2-methylthiacyclopentane (tentative)	NQ
1.19	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	300
1.35	C_7H_{12} isomer	180
1.40	1,cis-2-dimethylcyclohexane (tentative)	NQ
1.42	unknown	
1.46	cycloctadiene (tentative)	NQ
1.50	toluene	1200
1.58	unknown	
1.61	C_8H_{14} isomer	420
1.64	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	300
1.74	2,5-dimethylthiophene (tentative)	NQ
1.76	2,4,4-trimethylhexane	>100000
1.79	1,trans-2,cis-3-trimethylcyclopentane (tentative)	NQ
1.84	2,2,5,5-tetramethyl-trans-3-hexene (tentative)	NQ
1.86	n-octane	24000
1.89	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.97	m- and/or p-xylene	660
2.02	o-xylene	470
2.03	2-acetylthiophene (tentative)	NQ
2.04	unknown	
2.06	unknown	
2.11	2,3-dimethyl-3-ethylpentane	>100000
2.13	unknown	
2.14	unknown	
2.18	C_9H_{18} isomer	>100000

(Continued)

TABLE C54. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
2.25	o-ethyltoluene	370
2.29	n-nonane	>100000

*Relative to the internal standard 1,2-dibromoethane.

TABLE C55. LAWRENCE LIVERMORE SAMPLE #13(74:23) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	68000
0.27	methylene chloride	780
0.31	acetone	52000
0.35	carbon disulfide	29
0.36	propanenitrile (tentative)	NQ
0.60	2-butanone	53000
0.75	thiophene	64
0.82	methyl isopropyl ketone	4400
0.94	1-methylcyclopentene (tentative)	NQ
0.97	benzene	390
1.00	1,2-DIBROMOETHANE	IS
1.10	n-hexane	4700
1.13	methylcyclohexane	250
1.19	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	200
1.36	1-methylcyclohexene (tentative)	NQ
1.40	C_7H_{14} isomer	310
1.50	toluene	770
1.58	2,3,4-trimethyl-2-pentene (tentative)	NQ
1.61	trimethylcyclohexene isomer (tentative)	NQ
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	330
1.74	2,4-dimethylthiophene (tentative)	NQ
1.76	2,5-dimethylhexane	1800
1.79	C_8H_{16} isomer	14000
1.84	tetramethyl-trans-3-hexene (tentative)	NQ
1.87	n-octane	64000
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.97	m- and/or p-xylene	850
2.02	o-xylene	560
2.12	unknown	
2.28	unknown	
2.36	unknown	
2.38	unknown	
2.40	unknown	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C56. LAWRENCE LIVERMORE SAMPLE #14(74:23) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.22	acetonitrile	61000
0.28	methylene chloride	2000
0.32	acetone	87000
0.35	column artifact	
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	38000
0.81	methyl isopropyl ketone	2500
0.88	dihydropyran	330
0.98	benzene	460
1.00	1,2-DIBROMOETHANE	IS
1.03	air + pump oil	
1.10	2-methylthiacyclopentane (tentative)	NQ
1.18	2-methylpyrrole (tentative)	NQ
1.25	2-methylthiophene	180
1.50	toluene	620
1.53	unknown	
1.62	2,5-dimethylpyrrole	1000
1.73	ethylbenzene	100
1.74	2,3-dimethylthiophene (tentative)	NQ
1.79	2,4-dimethylthiophene (tentative)	NQ
1.83	column artifact	
1.98	m- and/or p-xylene	300
2.01	o-xylene	300
2.38	2,4,6-trimethylpyridine (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C57. LAWRENCE LIVERMORE SAMPLE #15(76:38) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	>100000
0.28	methylene chloride	4500
0.32	acetone	>100000
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	75000
0.81	methyl isopropyl ketone	6600
0.89	dihydropyran	1100
0.98	benzene	270
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.20	2-methylpyrrole (tentative)	NQ
1.26	2-methylthiophene	160
1.51	toluene	390
1.63	2,5-dimethylpyrrole	1200
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.73	ethylbenzene	100
1.74	2,5-dimethylthiophene (tentative)	NQ
1.79	unknown	
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.98	m- and/or p-xylene	290
2.02	o-xylene	230
2.06	unknown	
2.18	C_9H_{18} isomer	>100000
2.29	n-nonane	>100000

*Relative to the internal standard 1,2-dibromoethane.

TABLE C58. LAWRENCE LIVERMORE SAMPLE #16(76:38) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	55000
0.28	methylene chloride	1100
0.32	acetone	54000
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	42000
0.74	thiophene	20
0.81	methyl isopropyl ketone	4100
0.89	dihydropyran	450
0.98	benzene	230
1.00	1,2-DIBROMOETHANE	IS
1.09	n-hexane	2500
1.20	2-methylpyrrole (tentative)	NQ
1.26	2-methylthiophene	150
1.50	toluene	360
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	210
1.75	dimethylthiophene isomer (tentative)	NQ
1.79	C_8H_{16} isomer (tentative)	NQ
1.84	dimethylpyridine isomer column artifact	>100000
1.87	n-octane	9900
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.98	m- and/or p-xylene	320
2.02	o-xylene	270
2.04	unknown	
2.10	unknown	
2.18	C_9H_{16} isomer (tentative)	NQ
2.21	C_9H_{12} isomer	160
2.25	o-ethyltoluene	81
2.29	n-nonane	>100000
2.36	$C_{10}H_{14}$ isomer (tentative)	NQ
2.44	unknown	
2.49	unknown	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C59. LAWRENCE LIVERMORE SAMPLE #17(78:43) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	acetonitrile	57000
0.28	methylene chloride	200
0.32	acetone	57000
0.36	carbon disulfide	9
0.37	propanenitrile (tentative)	NQ
0.39	unknown	
0.60	2-butanone	38000
0.81	methyl isopropyl ketone	2100
0.89	dihydropyran	110
0.95	2-pentanone	5600
0.97	benzene	300
1.00	1,2-DIBROMOETHANE	IS
1.09	methylthiacyclopentane (tentative)	NQ
1.20	2-methylpyrrole (tentative)	NQ
1.26	2-methylthiophene	140
1.50	toluene	310
1.73	ethylbenzene	88
1.78	unknown	
1.80	2,4-dimethylthiophene (tentative)	NQ
1.82	column artifact	
1.98	m- and/or p-xylene	190
2.03	o-xylene	170
2.05	unknown	
2.36	C_9H_{20} isomer	>100000
2.37	trimethylpyridine (tentative)	NQ
	$C_{11}H_{24}$ isomer (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C60. LAWRENCE LIVERMORE SAMPLE #18(78:48) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	84000
0.28	methylene chloride	78
0.32	acetone	89000
0.35	carbon disulfide	18
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	44000
0.67	butanenitrile (tentative)	NQ
0.81	methyl isopropyl ketone	6300
0.89	dihydropyran	1400
0.96	2-pentanone	6300
0.99	benzene	270
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.20	2-methylpyrrole (tentative)	NQ
1.26	2-methylthiophene	130
1.52	toluene	370
1.56	2-ethylthiophene (tentative)	NQ
1.67	2,5-dimethylpyrrole	1800
1.75	ethylbenzene	170
1.76	dimethylthiophene (tentative)	NQ
1.86	dimethylpyridine isomer	>100000
2.00	m- and/or p-xylene	180
2.04	o-xylene	150
2.08	2-methyl-6-ethylpyridine (tentative)	NQ
2.15	2-octanone	640
2.39	mixture of alkanes	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C61. LAWRENCE LIVERMORE SAMPLE #19(80:15) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	58000
0.28	methylene chloride	300
0.32	acetone	66000
0.34	column artifact	
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	44000
0.74	thiophene	29
0.81	methyl isopropyl ketone	4800
0.89	dihydropyran	550
0.98	benzene	310
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.20	2-methylpyrrole (tentative)	NQ
1.25	methylthiophene isomer	120
1.26	2-methylthiophene	140
1.42	C_7H_{14} isomer	240
1.51	toluene	410
1.58	air spike	
1.62	unknown	
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	180
1.76	2,4-dimethylthiophene (tentative)	NQ
1.79	C_8H_{16} isomer	3900
1.86	unknown	
1.87	n-octane	11000
1.90	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.98	m- and/or p-xylene	330
2.02	o-xylene	250
2.04	2-acetylthiophene (tentative)	NQ
2.11	unknown	
2.14	unknown	
2.16	unknown	
2.17	unknown	
2.19	C_9H_{18} isomer	>100000
2.27	2,3-dimethylctane (tentative)	NQ
2.31	n-nonane	>100000
2.41	p-isopropyltoluene (tentative)	NQ
	trimethylpyridine (tentative)	NQ
2.43	unknown + column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C62. LAWRENCE LIVERMORE SAMPLE #20(82:45) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	47000
0.28	methylene chloride	150
0.32	acetone	44000
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	42000
0.74	thiophene	26
0.81	methyl isopropyl ketone	3600
0.89	dihydropyran	580
0.98	benzene	280
1.00	1,2-DIBROMOETHANE	IS
1.10	2-methylthiacyclopentane (tentative)	NQ
1.20	2-methylpyrrole (tentative)	NQ
1.26	2-methylthiophene	190
1.36	1-methylcyclohexene (tentative	NQ
1.42	dimethylcyclopentane (tentative)	NQ
1.50	toluene	470
1.62	unknown	
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	190
1.75	2,4-dimethylthiophene (tentative)	NQ
1.80	C_8H_{16} isomer (tentative)	NQ
1.85	2,2,5,5-tetramethyl-trans-3-hexene (tentative)	NQ
1.88	n-octane	16000
1.91	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.99	m- and/or p-xylene	450
2.03	o-xylene	350
2.06	C_9H_{12} isomer	89
2.19	C_9H_{18} isomer	>100000
2.26	o-ethyltoluene	100
2.30	n-nonane	>100000
2.38	t-butylbenzene	~390

*Relative to the internal standard 1,2-dibromoethane.

TABLE C63. LAWRENCE LIVERMORE SAMPLE #21(85:76) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.18	methanol	>100000
0.21	acetonitrile	84000
0.28	methlyene chloride	66
0.32	acetone	98000
0.35	carbon disulfide	12
0.37	propanenitrile (tentative)	NQ
0.57	2-methylpropanenitrile (tentative)	NQ
0.60	2-butanone	51000
0.68	butanenitrile (tentative)	NQ
0.74	thiophene	27
0.81	methyl isopropyl ketone	4800
0.89	dihydropyran	730
0.98	benzene	340
1.00	1,2-DIBROMOETHANE	IS
1.09	n-hexane	470
1.13	methylcyclohexane	39
1.20	2-methylpyrrole (tentative)	NQ
1.26	2-methylthiophene	160
1.35	1-methylcyclohexene (tentative)	NQ
1.37	unknown	
1.40	1,trans-2-dimethylcyclopentane (tentative)	NQ
1.43	$C_6H_{12}O$ isomer	180
1.49	toluene	570
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	210
1.74	2,4-dimethylthiophene (tentative)	NQ
1.78	$C_7H_{12}O$ isomer (tentative)	NQ
1.83	2,4-dimethylpyridine	>100000
	column artifact	
1.86	n-octane	19000
1.90	2,3,4,5 - tetramethyl-hexa-1,4-diene (tentative)	NQ
1.98	m- and/or p-xylene	600
2.02	o-xylene	460
2.04	unknown	
2.05	n-propylbenzene	190
2.08	unknown	
2.16	C_9H_{18} isomer	>100000
2.19	o-ethyltoluene	250
2.23	unknown	
2.27	n-nonane	>100000
2.36	tetramethylbenzene (tentative)	NQ
	trimethylpyridine (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C64. LAWRENCE LIVERMORE SAMPLE #22(88:75) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.18	methanol	>100000
0.22	acetonitrile	46000
0.27	methylene chloride	93
0.31	acetone	46000
0.35	carbon disulfide	17
0.36	propanenitrile (tentative)	NQ
0.60	2-butanone	24000
0.74	thiophene	30
0.81	methyl isopropyl ketone	1200
0.98	benzene	280
1.00	1,2-DIBROMOETHANE	IS
1.09	n-hexane	320
1.26	2-methylthiophene	130
1.37	4-methylcyclohexene (tentative)	NQ
1.42	C_7H_{14} isomer	1500
1.50	toluene	580
1.63	methylcyclohexanone (tentative)	NQ
1.65	1,1,3-trimethylcyclohexane (tentative)	NQ
1.71	3,5,5-trimethylcyclohexene (tentative)	NQ
1.73	ethylbenzene	330
1.76	2,5-dimethylthiophene (tentative)	NQ
1.81	1,trans-2,cis-3-trimethylcyclopentane (tentative)	NQ
1.86	2,2,5,5-tetramethyl-trans-3-hexene (tentative)	NQ
1.89	n-octane	21000
1.91	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.99	m- and/or p-xylene	810
2.03	o-xylene	650
2.12	unknown	
2.21	C_9H_{18} isomer	>100000
2.29	o-ethyltoluene	200
2.32	n-nonane	>100000
2.41	tetramethylbenzene (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C65. GC/MS CHROMATOGRAM OF LAWRENCE LIVERMORE BLANK (11-7-78) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.26	methylene chloride	<1
0.32	acetone	blank contaminant
0.36	carbon disulfide	<1
0.44	cyclopentane (tentative	NQ
0.52	chloroform	4
0.69	C_4H_8O isomer	21
0.96	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.49	toluene	<1
1.71	ethylbenzene	<1
1.82	column artifact	
1.95	m- and/or p-xylene	<1
1.98	o-xylene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE C66. GC/MS CHROMATOGRAM OF LAWRENCE LIVERMORE BLANK (11-7-78) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.27	methylene chloride	1
0.31	acetone	5
0.35	carbon disulfide	<1
0.43	cyclopentane (tentative)	NQ
0.51	chloroform	1
0.57	unknown	
0.97	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.38	column artifact	
1.51	toluene	<1
1.84	column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C67. LAWRENCE LIVERMORE DISTILLED WATER BLANK (11-8-78) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.27	methylene chloride	<1
0.29	unknown	
0.31	acetone	4
0.33	carbon disulfide	blank contaminant
0.92	trichloroethylene	14
0.97	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.51	toluene	<1
1.84	column artifact	
2.29	column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C68. LAWRENCE LIVERMORE BLANK (11-8-78) VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.27	methylene chloride	2
0.31	acetone	8
0.44	cyclopentane (tentative)	NQ
0.52	chloroform	4
0.57	unknown	
0.65	1,1,1-trichloroethane	<1
0.69	unknown	
0.97	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.50	toluene	<1
1.84	column artifact	
2.01	m- and/or p-xylene	<1
2.05	column artifact	
2.07	unknown	
2.14	unknown	
2.29	column artifact	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C69. PARAHOE MINE DUST CONTROL WATER VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	2600
0.40	chloroform	49
0.56	1,1,1-trichloroethane	79
0.62	bromodichloromethane	15
0.87	dibromochloromethane	5
0.93	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.55	toluene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE C70. PARAHOE WELL #4 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	65
0.43	chloroform	9
0.60	carbon tetrachloride	400
0.94	benzene	2
1.00	1,2-DIBROMOETHANE	IS
1.55	toluene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE C71. PARAHOE INDUSTRIAL POND VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	670
0.19	acetone	2700
0.22	carbon disulfide	15
0.94	benzene	45
1.00	1,2-DIBROMOETHANE	IS
1.54	toluene	46
1.83	2-hydroxycyclohexanone (tentative)	NQ
2.23	unknown	

*Relative to the internal standard 1,2-dibromoethane.

TABLE C72. PARAHOE RECYCLE GAS CONDENSATE VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	acetonitrile	>100000
0.12	methylene chloride	870
0.18	acetone	48000
0.24	succinonitrile (tentative)	NQ
0.51	2-butanone	>100000
0.69	thiophene	550
0.75	2-pentanone	16000
0.80	dihydropyran	2900
0.95	benzene	5400
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.14	2-methylcyclopentanone	>100000
1.28	3-methylthiophene	1200
1.38	2-hexanone	23000
1.51	methylpyridine isomer (tentative)	NQ
1.58	toluene	4900
1.72	dimethylpyrrole isomer	~2600
1.84	ethylbenzene	360
1.98	benzonitrile	11000
2.12	styrene	1000
2.13	m- and/or p-xylene	1600
2.18	o-xylene	960
2.22	2-methyl-6-ethylpyridine	~1100
2.25	2-octanone	6600
2.36	methylethylbenzene isomer	~73
2.40	trimethylbenzene isomer	~33
2.43	dimethylnonane isomer (tentative)	NQ
2.48	trimethylpyridine isomer (tentative)	NQ
2.56	unknown	
2.66	unknown	
2.71	2,4-dimethyl-6-ethyl pyridine (tentative	NQ
2.74	trimethylbenzene isomer	~310
2.79	trimethylbenzene isomer	~410
2.89	dimethyl nonane isomer (tentative)	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE C73. PARAHOE PROCESS WATER TK522 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	acetonitrile	61000
0.14	methylene chloride	1300
0.19	acetone	27000
0.25	succinonitrile (tentative)	NQ
0.51	2-butanone	38000
0.57	1,1,1-trichloroethane	120
0.69	thiophene	26
0.76	unknown	
0.92	2-pentanone	4500
0.96	benzene	500
1.00	1,2-DIBROMOETHANE	IS
1.29	3-methylthiophene	20
1.40	2-hexanone	1700
1.59	toluene	270
1.85	ethylbenzene	11
2.01	benzonitrile	610
2.13	m- and/or p-xylene	39
2.20	o-xylene	34
2.27	2-octanone	340

*Relative to the internal standard 1,2-dibromoethane.

TABLE C74. PARAHOE PRODUCT WATER TK500 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	70
0.69	thiophene	2
0.94	benzene	110
1.00	1,2-DIBROMOETHANE	IS
1.28	3-methylthiophene	11
1.56	toluene	160
1.84	ethylbenzene	18
2.13	m- and/or p-xylene	63
2.18	o-xylene	39
2.42	o-ethyltoluene	28

*Relative to the internal standard 1,2-dibromoethane.

TABLE C75. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #1(26:15) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.32	dimethylpyridine isomer	∿640
0.34	dimethylpyridine isomer	∿300
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.38	unknown	
0.39	TMS- ∿C_5 acid derivative, molecular weight 101 (tentative)	NQ
0.42	$C_7H_{10}O$ ketone, molecular weight 110 (tentative)	NQ
0.45	TMS-phenol	110
0.46	$C_2H_4S_3$ isomer (tentative)	NQ
0.47	TMS-branched $C_6H_{12}O_2$ acid isomer	∿97
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	290
0.53	TMS-m-cresol	∿120
0.54	TMS-p-cresol	160
0.56	TMS-branched $C_7H_{14}O_2$ acid isomer	∿390
0.58	TMS-benzyl alcohol (tentative)	NQ
0.62	TMS-dimethylphenol isomer	∿20
0.63	TMS-dimethylphenol isomer	∿24
0.64	TMS-n-octanoic acid	1000
0.68	TMS-3-nitrophenol	∿80
0.72	TMS-n-nonanoic acid	1300
0.79	TMS-n-decanoic acid	1400
0.86	TMS-n-undecanoic acid	∿460
0.93	TMS-n-dodecanoic acid	180
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C76. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #1(26:15) B/N.

Reltative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	unknown	
0.37	trimethylpyridine isomer	$\sim$240
0.38	trimethylpyridine isomer	$\sim$650
0.39	decene	$\sim$860
0.40	n-decane	910
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.42	branched alkane (tentative)	NQ
0.43	trimethylpyridine isomer + an alkene	$\sim$58
0.44	TMS-phenol	400
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.46	unknown	
0.46	C_9H_{13} isomer (tentative)	NQ
0.48	undecene	$\sim$1000
0.49	n-undecane	1200
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	$\sim$390
0.52	TMS-m-cresol	$\sim$140
0.53	TMS-p-cresol	80
0.57	TMS-aminocresol isomer (tentative)	NQ
0.57	dodecene	$\sim$600
0.58	n-dodecane	890
0.60	C_{11} branched alkane + TMS-C_2-alkylphenol isomer	$\sim$140
0.61	TMS-C_2 alkylphenol isomer	$\sim$50
0.61	$\sim C_{13}$ alkene (tentative)	NQ
0.62	TMS-C_2 alkylphenol isomer	$\sim$30
0.63	unknown	
0.65	C_{13} branched alkane	$\sim$250
0.66	$\sim C_{13}$ alkene (tentative)	NQ
0.66	tridecene	$\sim$160
0.67	n-tricdeane	420
0.68	unknown	
0.70	unknown	
0.71	alkene (tentative +	NQ
	TMS-$C_9H_{18}O_2$ acid isomer	$\sim$150
0.73	C_{14} branched alkane	$\sim$140
0.74	tetradecene	$\sim$110
0.75	n-tetradecene	280
0.79	TMS-$C_{10}H_{20}O_2$ acid isomer	$\sim$4
0.80	C_{15} branched alkane	$\sim$400
0.82	pentadecene	$\sim$200
0.83	n-pentadecane	420
0.86	TMS-$c_{11}H_{22}O_2$ acid isomer	$\sim$52
0.89	hexadecene	$\sim$130
0.90	n-hexadecane	270

(continued)

TABLE C76. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.93	C_{17} branched alkane	∿120
0.96	heptadecene	∿120
0.97	n-heptadecane	280
0.97	C_{18} branched alkane	∿110
0.98	C_{18} alkene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	∿60
1.03	n-octadecane	120
1.04	C_{19} branched alkane	∿120
1.08	nonacecene	∿66
1.09	n-nonadecane	150
1.14	eicosene	∿40
1.15	n-eicosane	130
1.20	heneicosene	∿27
1.20	n-heneicosane	120
1.25	docosene	∿40
1.25	n-docosane	130
1.30	tricosene	∿14
1.31	n-tricosane	130
1.35	tetracosene	∿29
1.35	n-tetracosane	150
1.40	n-pentacosane	180
1.46	n-hexacosane	170
1.54	n-heptacosane	∿170
1.63	n-octacosane	∿120
1.74	n-nonacosane	∿170

*Relative to the internal standard D-10 anthracene.

TABLE C77. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #2(30:40) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.33	TMS- ∿C_4 derivative, molecular weight 100 (tentative)	NQ
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	TMS- ∿C_5 derivative, molecular weight 101 (tentative)	NQ
0.39	TMS- ∿C_5 derivative, molecular weight 133 (tentative)	NQ
0.40	TMS- ∿$C_5H_{11}NO$ isomer, molecular weight 101 (tentative)	NQ
0.42	$C_7H_{10}O$ ketone, molecular weight 110 (tentative)	NQ
0.46	TMS-phenol	1100
0.48	TMS-branched $C_6H_{12}O_2$ acid isomer	∿210
0.52	TMS derivatization artifact	
0.53	TMS-o-cresol	510
0.54	TMS-m-cresol	∿380
0.54	TMS-p-cresol	450
0.56	TMS-branched $C_7H_{14}O_2$ acid isomer	∿840
0.61	TMS-dimethylphenol isomer	∿72
0.62	TMS-dimethylphenol isomer	∿94
0.63	TMS-dimethylphenol isomer + TMS-branched $C_9H_{18}O_2$ isomer	∿380
0.64	TMS-n-octanoic acid	2600
0.68	TMS-3-nitrophenol	∿1100
0.72	TMS-n-nonanoic acid	4600
0.79	TMS-n-decanoic acid	4000
0.86	TMS-n-undecanoic acid	∿1800
0.93	TMS-n-dodecanoic acid + TMS-$C_{15}H_{28}O$ isomer (tentative)	∿900 NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C78. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #2(30:40) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	unknown	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿1200
0.38	trimethylpyridine isomer	∿1800
0.39	branched alkane + trimethylpyridine isomer	∿430
0.39	trimethylpyridine isomer + unknown	∿530
0.39	unknown	
0.40	n-decane	840
0.41	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	810
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿27
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.48	unknown	
0.48	undecene	∿830
0.49	isophorone	790
0.49	n-undecane	930
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	∿570
0.52	TMS-m-cresol	∿360
0.53	TMS-p-cresol	340
0.56	trimethylpyridine isomer	∿90
0.57	TMS-aminocresol isomer (tentative)	NQ
0.57	dodecene	∿640
0.58	n-dodecane	830
0.60	TMS-C_2 alkylphenol isomer	∿200
0.61	TMS-C_2 alkylphenol isomer	∿120
0.62	TMS-C_2 alkylphenol isomer	∿71
0.63	unknown	
0.65	C_{13} branched alkane	∿230
0.66	tridecene	∿260
0.67	n-tridecane	490
0.68	TMS-C_2 alkylphenol isomer	∿160
0.70	TMS-C_3 alkylphenol isomer	∿170
0.71	TMS-$C_9H_{18}O_2$ acid isomer + unknown	∿130
0.73	C_{14} branched alkane	∿130
0.74	tetradecene	∿110
0.75	n-tetradecane	220
0.79	TMS-$C_{10}H_{20}O_2$ acid isomer	∿56
0.80	C_{15} branched alkane	∿410
0.82	pentadecene	∿190

(continued)

TABLE C78. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.83	n-pentadecane	370
0.86	TMS-$C_{11}H_{22}O_2$ acid isomer	~110
0.89	hexadecene	~130
0.90	n-hexadecane	250
0.93	C_{17} branched alkane	~98
0.96	heptadecene	~110
0.97	n-heptadecane	240
0.97	C_{18} branched alkane	~100
0.99	unknown	NQ
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	~51
1.03	n-octadecane	60
1.04	C_{19} branched alkane	~77
1.08	nonadecene	~49
1.09	n-nonadecane	120
1.14	eicosene	~40
1.15	n-eicosane	130
1.20	n-heneicosane	100
1.25	docosene	~29
1.26	n-docosane	94
1.31	n-tricosane	110
1.36	n-tetracosane	98
1.40	pentacosene + bis-2-ethylhexyl phthalate	~38
1.41	n-pentacosane	120
1.47	n-hexacosane	150
1.54	n-heptacosane	~160
1.62	n-octacosane	~130
1.74	n-nonacosane	~160

*Relative to the internal standard D-10 anthracene.

TABLE C79. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #3(34:00) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	TMS derivatization artifact	
0.37	TMS- $\sim C_6$ derivative, molecular weight 117 (tentative)	NQ
0.38	TMS derivatization artifact	
0.39	TMS- $\sim C_5$ derivative, molecular weight 133 (tentative)	NQ
0.39	TMS- $\sim C_5$ derivative, molecular weight 101 (tentative)	NQ
0.45	TMS-phenol	150
0.46	$C_2H_4S_3$ isomer (tentative)	NQ
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	480
0.53	TMS-m-cresol	~340
0.54	TMS-p-cresol	370
0.56	TMS-branched $C_7H_{14}O_2$ acid isomer	~350
0.58	TMS-benzyl alcohol (tentative)	NQ
0.64	unknown	
0.68	TMS-3-nitrophenol	~430
0.72	TMS-n-nonanoic acid	1400
0.79	TMS-n-decanoic acid	1500
0.80	$C_3H_6S_4$ isomer (tentative)	NQ
0.86	TMS-n-undecanoic acid	~660
0.92	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C80. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #3(34:00) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	unknown	
0.35	trimethylpyridine isomer	∿760
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿1300
0.38	trimethylpyridine isomer	∿2200
0.39	alkene (tentative)	NQ
0.40	unknown	
0.41	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.43	trimethylpyridine isomer	∿68
0.44	TMS-phenol	1100
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿38
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.49	isophrone	1500
0.49	n-undecane	210
0.51	TMS derivatization artifact	
0.51	$C_9H_{13}N$ isomer (tentative)	NQ
0.51	TMS-o-cresol	∿600
0.52	TMS-m-cresol	∿460
0.53	TMS-p-cresol	560
0.57	TMS-aminocresol isomer (tentative)	NQ
0.58	n-dodecane	170
0.60	TMS-c_2 alkylphenol isomer	∿190
0.61	TMS-c_2 alkylphenol isomer	∿200
0.62	TMS-C_2 alkylphenol isomer	∿87
0.63	unknown	
0.66	tridecene	∿55
0.67	n-tridecane	140
0.68	unknown	
0.70	unknown	
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿87
0.79	alkene (tentative)	NQ
0.79	TMS-n-decanoic acid	250
0.80	branched alkane	∿61
0.86	TMS-n-undecanoic acid	∿230
0.93	unknown	
0.93	TMS-n-dodecanoic acid	400
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.26	n-docosane	33
1.31	n-tricosane	43
1.36	n-tetracosane	54

(continued)

TABLE C80. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.41	n-pentacosane	85
1.47	n-hexacosane	80
1.54	n-heptacosane	∿87
1.62	n-octacosane	∿68

*Relative to the internal standard D-10 anthracene.

TABLE C81. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #4(37:25) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	TMS-n-pentanoic acid	800
0.39	TMS-$C_6H_{15}O_2N$ isomer (tentative)	NQ
0.39	TMS- $\sim C_5$ derivative, molecular weight 101 (tentative)	NQ
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	∼310
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	∼160
0.45	TMS-phenol	1100
0.45	TMS- $\sim C_6$ derivative, molecular weight 117 (tentative)	NQ
0.47	TMS-n-hexanoic acid	2300
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	∼150
0.51	TMS-branched $C_7H_{14}O_2$ acid isomer	∼160
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	360
0.53	TMS-m-cresol	∼560
0.54	TMS-p-cresol	440
0.56	TMS-n-heptanoic acid	∼5000
0.58	TMS-branched $C_8H_{16}O_2$ acid isomer	∼680
0.61	TMS-$C_8H_{14}O_2$ acid isomer	∼96
0.63	TMS-branched $C_9H_{18}O_2$ acid isomer	∼810
0.63	TMS- $\sim C_7$ derivative, molecular weight 127 (tentative)	NQ
0.64	TMS-n-octanoic acid	8900
0.66	TMS-branched $C_9H_{18}O_2$ acid isomer	∼340
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	∼530
0.68	TMS-3-nitrophenol	∼2300
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	∼540
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∼1300
0.72	TMS-n-nonanoic acid	11000
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∼250
0.78	TMS-$C_{10}H_{20}O_2$ acid isomer	∼910
0.79	TMS-n-decanoic acid	9400
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	∼510
0.86	TMS-n-undecanoic acid	∼4200
0.93	TMS-$C_{15}H_{20}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C82. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #4(37:25) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	unknown	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿170
0.38	trimethylpyridine isomer	∿2100
0.38	unknown	
0.39	trimethylpyridine isomer + unknown	∿540
0.39	tirmethylpyridine isomer	∿76
0.40	n-decane + unknown	∿540
0.41	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.43	trimethylpyridine isomer	∿64
0.44	TMS-phenol + trimethylpyridine isomer	∿1600
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.46	trimethylpyridine isomer	∿2
0.46	unknown	
0.49	isophorone	1600
0.49	n-undecane	170
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	∿920
0.52	TMS-m-cresol	∿460
0.53	TMS-p-cresol	590
0.57	TMS-aminocresol isomer (tentative)	NQ
0.58	n-dodecane	110
0.59	TMS-C_2 alkylphenol isomer	∿25
0.60	TMS-C_2 alkylphenol isomer	∿240
0.61	TMS-C_2 alkylphenol isomer	∿160
0.62	TMS-C_2 alkylphenol isomer	∿120
0.63	unknown	
0.66	unknown + tridecane	∿31
0.67	n-tridecane	∿71
0.68	unknown	
0.70	TMS-C_3 alkylphenol isomer	∿130
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿69
0.72	TMS-nitrophenol isomer + unknown	∿150
0.79	TMS-$C_{10}H_{20}O_2$ acid isomer	∿240
0.83	n-pentadecane	56
0.86	TMS-$C_{11}H_{22}O_2$ acid isomer	∿190
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.93	TMS-$C_{12}H_{24}O_2$ acid isomer	∿320
0.96	n-heptadecane	51
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	31
1.04	C_{19} branched alkane + unknown	∿140

(continued)

TABLE C82. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.09	n-nonadecane	54
1.15	n-eicosane + unknown	∿86
1.20	n-heneiconane	23
1.26	n-docosane	26
1.31	n-tricosane	41
1.36	n-tetracosane	54
1.41	n-pentacosane	79
1.47	n-hexacosane	74
1.54	n-heptacosane	∿80
1.62	N-octacosane	∿63
1.74	n-nonacosane	∿62
1.87	n-triacontane (tentative)	NQ
2.05	n-hentriacontane (tentative)	NQ

*Relative to the internal standard D-10 anthracene.

TABLE C83. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #5(42:06) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	TMS-branched $C_5H_{10}0_2$ acid isomer	∿1200
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	8300
0.40	TMS-branched $C_6H_{12}0_2$ acid isomer	∿110
0.40	TMS-branched $C_6H_{12}0_2$ acid isomer	∿750
0.41	TMS-branched $C_6H_{12}0_2$ acid isomer	∿2200
0.43	TMS-branched $C_6H_{12}0_2$ acid isomer	∿770
0.44	TMS-branched $C_6H_{12}0_2$ acid isomer	∿1100
0.44	TMS-phenol	410
0.45	unknown	
0.47	TMS-n-hexanoic acid	11000
0.49	TMS-branched $C_7H_{14}0_2$ acid isomer	∿1500
0.51	TMS derivatization artifact	
0.52	TMS-o-cresol	72
0.52	TMS-branched $C_7H_{14}0_2$ acid isomer	∿1600
0.53	TMS-p-cresol + TMS-branched $C_7H_{14}0_2$ acid isomer	∿1100
0.56	TMS-n-heptanoic acid	∿15000
0.57	TMS-$C_8H_{14}0_2$ acid isomer + unknown	∿340
0.58	TMS-branched $C_8H_{16}0_2$ acid isomer	∿2000
0.58	TMS-$C_7H_{12}0_2$ acid isomer	∿360
0.59	TMS-branched $C_8H_{16}0_2$ acid isomer	∿450
0.60	TMS-$C_8H_{14}0_2$ acid isomer	∿760
0.60	TMS-branched $C_8H_{16}0_2$ acid isomer	∿810
0.61	TMS-branched $C_8H_{16}0_2$ acid isomer	∿800
0.62	TMS-branched $C_9H_{18}0_2$ acid isomer	∿970
0.63	TMS-$C_8H_{14}0_2$ acid isomer	∿4100
0.65	TMS-n-octanoic acid	15000
0.66	TMS-branched $C_9H_{18}0_2$ acid isomer	∿840
0.67	TMS-branched $C_9H_{18}0_2$ acid isomer	∿1400
0.68	TMS-3-nitrophenol	∿720
0.68	TMS-$C_9H_{16}0_2$ acid isomer	∿750
0.69	TMS-$C_{10}H_{18}0_2$ acid isomer + unknown	∿1500
0.70	TMS-$C_{10}H_{18}0_2$ acid isomer	∿730
0.71	TMS-$C_9H_{16}0_2$ acid isomer	∿3000
0.72	TMS-n-nonanoic acid	6100
0.73	unknown	
0.73	TMS-$C_9H_{16}0_2$ acid isomer	∿1100
0.73	TMS-branched $C_{10}H_{20}0_2$ acid isomer	∿470
0.74	TMS-$C_{10}H_{18}0_2$ acid isomer	∿220
0.75	TMS-$C_{10}H_{18}0_2$ acid isomer	∿580
0.76	TMS-branched $C_{10}H_{20}0_2$ acid isomer	∿190
0.76	TMS-branched $C_{10}H_{20}0_2$ acid isomer	∿100
0.77	TMS-branched $C_{10}H_{20}0_2$ acid isomer	∿84
0.79	TMS-$C_{10}H_{18}0_2$ acid isomer	∿2100

(continued)

TABLE C83. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.80	TMS-n-decanoic acid	6800
0.80	TMS-branched $C_{12}H_{24}O_2$ acid isomer	~640
0.83	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~380
0.84	unknown	
0.85	TMS-$C_{12}H_{22}O_2$ acid isomer	~110
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	~730
0.87	TMS-n-undecanoic acid	~2100
0.87	unknown	
0.93	unknown	
0.98	TMS-n-dodecanoic acid	160
1.00	D-10 ANTHRACENE	IS
1.04	TMS-n-tridecanoic acid	~1600
1.17	TMS-n-hexadecanoic acid	~280
1.35	n-tetracosane	47
1.40	n-pentacosane	82
1.46	n-hexacosane	94
1.53	n-heptacosane	~82

*Relative to the internal standard D-10 anthracene.

TABLE C84. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #5 (42:06) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	unknown	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿1200
0.38	trimethylpyridine isomer	∿1700
0.38	trimethylpyridine isomer + alkene	∿530
0.40	n-decane	990
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	1000
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.46	trimethylpyridine isomer + unknown	∿69
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.48	undecene	∿730
0.49	isophorone	620
0.49	n-undecane	520
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	∿970
0.52	TMS-m-cresol	∿680
0.53	TMS-p-cresol	450
0.56	unknown	
0.57	unknown	
0.57	dodecene	∿350
0.58	n-dodecane	470
0.60	TMS-C_5 alkylphenol isomer	∿300
0.61	TMS-C_2 alkylphenol isomer	∿130
0.62	TMS-C_2 alkylphenol isomer	∿130
0.63	unknown	
0.63	unknown	
0.65	C_{13} branched alkane + unknown	∿230
0.66	tridecene	∿120
0.67	n-tridecane	560
0.67	TMS-nitrophenol isomer	∿520
0.68	TMS-C_3 alkylphenol isomer	∿280
0.69	unknown	
0.70	TMS- ∿C_4 alkylphenol isomer (tentative)	NQ
0.71	TMS-n-nonanoic acid	450
0.72	TMS-nitrophenol isomer	∿960
0.73	unknown	
0.74	tetradecene	∿78
0.75	TMS-nitrophenol isomer	∿630
0.75	n-tetradecane	270

(continued)

TABLE C84. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.79	unknown	
0.79	TMS-n-decanoic acid	620
0.80	C_{15} branched alkane	∿240
0.80	unknown	
0.83	n-pentadecane	150
0.86	TMS-n-undecanoic acid	∿60
0.89	hexadecene	∿36
0.90	n-hexadecane	320
0.93	unknown	
0.96	heptadecene	∿88
0.97	n-heptadecane	160
0.97	C_{18} branched alkane	∿97
0.99	alkene (tentative)	NQ
0.99	TMS-n-tridecanoic acid	∿94
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.02	octadecene	∿33
1.03	n-octadecane	61
1.04	C_{19} branched alkane	∿110
1.09	n-nondecane	71
1.14	eicosene	∿37
1.15	n-eicosane	110
1.20	n-heneicosane	96
1.26	n-docosane	90
1.30	tricosene	∿22
1.31	n-tricosane	91
1.35	tetracosene	∿27
1.36	n-tetracosane	120
1.41	n-pentacosane	160
1.47	n-hexacosane	120
1.54	n-heptacosane	∿150
1.62	n-octacosane	∿120
1.74	n-nonacosane	∿140
1.87	n-triacontane	∿70

*Relative to the internal standard D-10 anthracene.

TABLE C85. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #6(47:90) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	TMS derivatization artifact	
0.37	unknown	
0.38	TMS derivatization artifact	
0.38	unknown	
0.39	TMS- $\sim C_5$ derivative, molecular weight 101 (tentative)	NQ
0.42	unknown	
0.45	TMS-phenol	720
0.47	TMS-$C_6H_{12}O_2$ acid isomer	∿730
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	800
0.53	TMS-m-cresol	∿630
0.54	TMS-p-cresol	570
0.56	TMS-$C_7H_{14}O_2$ acid isomer	∿3700
0.58	TMS-C_7H_8O isomer (tentative)	NQ
0.61	TMS-ethylphenol isomer	∿390
0.62	TMS-derivative, molecular weight 122 (tentative)	NQ
0.63	TMS-$C_9H_{18}O_2$ acid isomer	∿630
0.64	TMS-n-octanoic acid	9100
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	∿250
0.68	TMS-3-nitrophenol	∿580
0.71	TMS-p-toluic acid	1200
0.72	TMS-n-nonanoic acid	12000
0.79	TMS-n-decanoic acid	8600
0.86	TMS-n-undecanoic acid	∿2100
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C86. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #6(47:90) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethlypyridine isomer	∿1400
0.38	trimethlypyridine isomer	∿1800
0.38	unknown	
0.39	alkene + trimethylpyridine isomer	∿990
0.40	n-decane	930
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	1100
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿19
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	unknown	
0.48	unknown	
0.48	undecene	∿710
0.49	isophorone	810
0.49	n-undecane	730
0.51	TMS derivatization artifact	
0.51	$C_9H_{13}N$ isomer (tentative)	NQ
0.51	TMS-o-cresol	∿460
0.52	TMS-m-cresol	∿450
0.53	TMS-p-cresol	390
0.56	unknown	
0.57	unknown	
0.57	dodecene	∿440
0.58	n-dodecane	670
0.60	TMS-C_2 alkylphenol	∿310
0.61	TMS-C_2 alkylphenol	∿120
0.62	TMS-C_2 alkylphenol	∿78
0.62	unknown	
0.65	phthalate (tentative)	NQ
0.65	C_{13} branched alkane	∿270
0.66	tridecene	∿160
0.67	n-tridecene	350
0.69	TMS-C_4 alkylphenol (tentative)	NQ
0.71	TMS-n-nonanoic acid	180
0.72	TMS-nitrophenol isomer	∿240
0.73	C_{14} branched alkane	∿320
0.74	tetradecene	∿270
0.75	TMS-nitrophenol isomer	∿120
0.75	n-tetradecane	250
0.79	TMS-n-decanoic acid	210
0.80	C_{15} branched alkane	∿480
0.82	pentadecene	∿170

(continued)

TABLE C86. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.83	n-pentadecane	450
0.86	TMS-n-undecanoic acid	∿240
0.89	hexadecene	∿140
0.90	n-hexadecane	260
0.93	C_{17} branched alkane	∿77
0.96	heptadecene	∿98
0.96	n-heptadecane	270
0.97	C_{18} branched alkane	∿100
0.98	C_{18} alkene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	∿63
1.03	n-octadecane	122
1.04	C_{19} branched alkane	∿140
1.08	nonadecene	∿36
1.09	n-nonadecane	150
1.14	eicosene	∿34
1.14	n-eicosane	170
1.20	n-henicosene	∿31
1.20	n-heneicosane	120
1.25	docosene	∿39
1.25	n-docosane	120
1.30	tricosene	∿19
1.30	n-tricosane	140
1.35	tetracosene	∿44
1.35	n-tetracosane	150
1.40	pentacosane	∿37
1.40	n-pentacosane	260
1.46	hexacosene	∿73
1.46	n-hexacosane	240
1.54	n-heptacosane	∿220
1.62	n-octacosane	∿180
1.74	n-nonacosane	∿240
1.88	n-triacontane	∿98
2.05	n-hentriacontane	∿110

*Relative to the internal standard D-10 anthracene.

TABLE C87. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #7(50:76) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	TMS-branched $C_5H_{10}O_2$ acid isomer	∿560
0.35	TMS-branched $C_5H_{10}O_2$ acid isomer	∿360
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	TMS-n-pentanoic acid	3700
0.39	TMS-∿C_5 derivative, molecular weight 101 (tentative)	NQ
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	∿94
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	∿680
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	∿190
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	∿380
0.45	TMS-phenol	670
0.46	TMS-$C_6H_{10}O_2$ acid isomer	∿230
0.47	TMS-n-hexanoic acid	5200
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	∿270
0.51	TMS-branched $C_7H_{14}O_2$ acid isomer	∿300
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	400
0.53	TMS-$C_7H_{12}O_2$ acid isomer	∿620
0.53	TMS-m-cresol	∿630
0.54	TMS-p-cresol	370
0.55	TMS-$C_7H_{12}O_2$ acid isomer	∿490
0.56	TMS-n-heptanoic acid	∿7500
0.58	TMS-branched $C_8H_{16}O_2$ acid isomer	∿770
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿400
0.61	TMS-branched $C_8H_{16}O_2$ acid isomer	∿390
0.63	TMS-branched $C_9H_{18}O_2$ acid isomer	∿500
0.63	TMS-$C_8H_{14}O_2$ acid isomer + unknown	1300
0.64	TMS-n-octanoic acid	11000
0.65	TMS-$C_8H_{14}O_2$ acid isomer	∿420
0.66	TMS-branched $C_9H_{18}O_2$ acid isomer	∿190
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	∿630
0.68	TMS-3-nitrophenol	∿1100
0.69	TMS-branched $C_9H_{18}O_2$ acid isomer	∿220
0.69	unknown	
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	∿430
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿1700
0.72	TMS-n-nonanoic acid	12000
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿200
0.75	TMS-$C_{10}H_{18}O_2$ acid isomer	∿170
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	∿820
0.79	TMS-n-decanoic acid	9200
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	∿500
0.86	TMS-n-undecanoic acid	∿3700
0.92	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C88. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #7(50:76) B/N.

Relative Response Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	unknown	
0.35	trimethylpyridine isomer	∿15
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿3700
0.38	trimethylpyridine isomer	∿4500
0.38	unknown	
0.39	trimethylpyridine isomer	∿1200
0.39	unknown	
0.40	branched alkane (tentative)	NQ
0.41	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	2700
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿42
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	unknown	
0.48	unknown	
0.49	isophorone	3100
0.49	n-undecane	490
0.50	TMS-thiophenol isomer (tentative)	NQ
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	∿2000
0.52	TMS-m-cresol	∿1200
0.53	TMS-p-cresol	1300
0.56	alkene (tentative)	NQ
0.57	C_7H_9NO isomer (tentative)	NQ
0.57	dodecene	∿440
0.58	n-dodecane	350
0.59	TMS-C_2 alkylphenol isomer	∿26
0.59	unknown	
0.60	TMS-C_2 alkylphenol isomer	∿560
0.61	TMS-C_2 alkylphenol isomer	∿370
0.62	TMS-C_2 alkylphenol isomer	∿280
0.62	unknown	
0.63	TMS-C_2 alkylphenol isomer	∿190
0.63	unknown	
0.66	tridecene	∿120
0.67	unknown	
0.67	n-tridecane	390
0.68	unknown	
0.69	unknown	
0.70	unknown	

(contained)

TABLE C88. (continued)

Relative Response Time (RRT)*	Compound Identification	Concentration (ppb)
0.71	TMS-$C_9H_{18}O_2$ acid isomer	~260
0.72	TMS-nitrophenol isomer	~870
0.74	TMS-nitrophenol isomer	~640
0.75	n-tetradecane	110
0.79	unknown	
0.79	TMS-n-decanoic acid	660
0.80	unknown	
0.83	n-pentadecane	270
0.86	TMS-n-undecanoic acid	~770
0.87	unknown	
0.90	n-hexadecane	400
0.93	unknown	
0.97	n-heptadecane	290
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.03	n-octadecane	120
1.04	C_{19} branched alkane	~270
1.09	n-nonadecane	160
1.15	n-eicosane	240
1.20	n-heneicosane	150
1.26	n-docosane	140
1.31	n-tricosane	150
1.36	n-tetracosane	160
1.41	n-pentacosane	260
1.47	n-hexacosane	210
1.54	n-heptacosane	~250
1.62	n-octacosane	~200
1.74	n-nonacosane	~260

*Relative to the internal standard D-10 anthracene.

TABLE C89. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #8(54:33) A.

Relative Response Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	TMS-branched $C_5H_{10}O_2$ acid isomer	640
0.34	TMS-branched $C_5H_{10}O_2$ acid isomer	440
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	TMS-n-pentanoic acid	4100
0.39	TMS- $\sim C_5$ derivative, molecular weight 101 (tentative)	NQ
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	580
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	220
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	420
0.45	TMS-phenol	840
0.47	TMS-n-hexanoic acid	5300
0.49	TMS-branched $C_7H_{14}C_2$ acid isomer	240
0.51	TMS-branched $C_7H_{14}O_2$ acid isomer	200
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	120
0.53	TMS-branched $C_7H_{14}O_2$ acid isomer	440
0.53	TMS-m-cresol + TMS-branched $C_7H_{14}O_2$ acid isomer	500
0.54	TMS-p-cresol	150
0.55	TMS-$C_7H_{12}O_2$ acid isomer	500
0.56	TMS-n-heptanoic acid	7800
0.58	TMS-branched $C_8H_{16}O_2$ acid isomer	580
0.58	TMS-$C_7H_{12}O_2$ acid isomer	180
0.61	TMS-$C_8H_{14}O_2$ acid isomer	140
0.61	TMS-$C_8H_{14}O_2$ acid isomer	240
0.63	TMS-branched $C_9H_{18}O_2$ acid isomer	380
0.63	TMS- $\sim C_7$ derivative, molecular weight 127 (tentative)	NQ
0.64	TMS-n-octanoic acid	9700
0.65	TMS-$C_8H_{14}O_2$ acid isomer	140
0.66	TMS-branched $C_9H_{18}O_2$ acid isomer	160
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	440
0.68	TMS-2-nitrophenol	540
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	380
0.71	TMS-$C_9H_{16}O_2$ acid isomer	1400
0.72	TMS-n-nonanoic acid	8200
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	180
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	440
0.79	TMS-n-decanoic acid	6900
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	320
0.86	TMS-n-undecanoic acid	2400
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C90. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #8(54:33) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿3700
0.38	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	1400
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿48
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.48	isophorone	1360
0.49	n-undecane	100
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	∿1100
0.52	TMS-m-cresol	∿790
0.53	TMS-p-cresol	830
0.57	C_7H_9NO isomer (tentative)	NQ
0.58	n-dodecane	150
0.60	TMS-C_2 alkylphenol isomer	∿27
0.61	TMS-C_2 alkylphenol isomer	∿300
0.62	TMS-C_2 alkylphenol isomer	∿190
0.62	TMS-C_2 alkylphenol isomer	∿150
0.62	unknown	
0.62	TMS-C_2 alkylphenol isomer	∿90
0.63	unknown	
0.64	phthalate (tentative)	NQ
0.67	$C_{13}H_{28}$ isomer (tentative)	NQ
0.68	unknown	
0.69	unknown	
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿140
0.72	TMS-nitrophenol isomer	∿490
0.74	TMS-nitrophenol isomer	∿190
0.79	TMS-n-decanoic acid	400
0.80	unknown	
0.86	TMS-$C_{11}H_{22}O_2$ acid isomer	∿460
0.90	n-hexadecane	71
0.93	unknown	
0.93	TMS-$C_{12}H_{24}O_2$ acid isomer	∿740
0.96	n-heptadecane	77
0.99	unknown	
0.99	TMS-$C_{13}H_{26}O_2$ acid isomer	∿220
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.04	n-octadecane	93
1.06	TMS-$C_{14}H_{28}O_2$ acid isomer	∿66

(continued)

TABLE C90. (continued)

Relative Response Time (RRT)*	Compound Identification	Concentration (ppb)
1.09	n-nonadecane	47
1.15	n-eicosane	89
1.20	n-heneicosane	42
1.25	n-docosane	32
1.30	n-tricosane	54
1.35	n-tetracosane	64
1.40	n-pentacosane	90
1.46	n-hexacosane	94
1.54	n-heptacosane	∿110
1.62	N-octacosane	∿88
1.74	n-nonacosane	∿95

*Relative to the internal standard D-10 anthracene.

TABLE C91. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #9(57:84) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	TMS-branched $C_5H_{10}O_2$ acid isomer	$\sim$2100
0.34	TMS-branched $C_5H_{10}O_2$ acid isomer	$\sim$1200
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	TMS-n-pentanoic acid	11000
0.39	TMS- $\sim C_5$ derivative, molecular weight 101 (tentative)	NQ
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	$\sim$1800
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	$\sim$620
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	$\sim$1200
0.45	TMS-phenol	1500
0.47	TMS-n-hexanoic acid	14000
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	$\sim$660
0.51	TMS-branched $C_7H_{14}O_2$ acid isomer	$\sim$460
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	590
0.53	TMS-$C_7H_{12}O_2$ acid isomer	$\sim$1300
0.53	TMS-branched $C_7H_{14}O_2$ acid isomer + TMS-m-cresol	$\sim$1300
0.54	TMS-p-cresol	620
0.55	TMS-C_7 acid isomer	$\sim$1300
0.56	TMS-n-heptanoic acid	$\sim$19000
0.57	TMS-C_7H_9NO isomer (tentative)	NQ
0.58	TMS-branched $C_8H_{16}O_2$ acid isomer	$\sim$1600
0.58	TMS-$C_7H_{12}O_2$ acid isomer	$\sim$500
0.61	TMS-$C_8H_{14}O_2$ acid isomer	$\sim$640
0.63	TMS-branched $C_9H_{18}O_2$ acid isomer	$\sim$1100
0.63	TMS- $\sim C_7$ derivative, molecular weight 242 (tentative)	NQ
0.64	TMS-$C_9H_{11}O$ isomer (tentative)	NQ
0.64	TMS-n-octanoic acid	22000
0.66	TMS-branched $C_9H_{18}O_2$ acid isomer	$\sim$370
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	$\sim$930
0.68	TMS-3-nitrophenol	$\sim$3400
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	$\sim$920
0.71	TMS-$C_9H_{16}O_2$ acid isomer	$\sim$2800
0.72	TMS-n-nonanoic acid	18000
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	$\sim$300
0.78	TMS-branched $C_{10}H_{20}O_2$ acid isomer	$\sim$940
0.79	TMS-n-decanoic acid	15000
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	$\sim$400
0.86	TMS-n-undecanoic acid	$\sim$4400
0.93	TMS-$C_{15}H_{28}O$ (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE C92. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #9(57:84) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	unknown	
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	trimethylpyridine isomer	$\sim$1100
0.38	trimethylpyridine isomer	$\sim$1600
0.39	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	1100
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	$\sim$31
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.48	unknown	
0.48	undecene	$\sim$230
0.49	isophorone	810
0.49	n-undecane	140
0.50	TMS-thiophenol isomer (tentative)	NQ
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	$\sim$860
0.52	TMS-m-cresol	$\sim$570
0.53	TMS-p-cresol	620
0.57	TMS-c_7H_9NO isomer (tentative)	NQ
0.57	dodecane	$\sim$170
0.58	n-dodecane	190
0.59	TMS-C_2alkylphenol isomer	$\sim$21
0.60	TMS-C_2 alkylphenol isomer	$\sim$260
0.61	TMS-C_2 alkylphenol isomer	$\sim$160
0.62	TMS-C_2 alkylphenol isomer	$\sim$90
0.63	TMS-C_2 alkylphenol isomer	$\sim$20
0.63	unknown	
0.65	$\sim C_{13}$ alkane isomer (tentative)	NQ
0.66	tridecene	$\sim$73
0.67	n-tridecane	240
0.68	unknown	
0.71	TMS-$C_9H_{18}O_2$ acid isomer	$\sim$140
0.72	TMS-nitrophenol isomer	$\sim$450
0.73	unknown	
0.74	tetradecene	$\sim$110
0.75	TMS-nitrophenol isomer	$\sim$210
0.75	n-tetradecane	130
0.79	TMS-n-decanoic acid	360
0.80	unknown	
0.82	pentadecene	$\sim$72

(continued)

TABLE C92. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.83	n-pentadecane	230
0.86	TMS-n-undecanoic acid	∿370
0.89	hexadecene	∿24
0.90	n-hexadecane	160
0.93	unknown	
0.93	TMS-$C_{12}H_{24}O_2$ acid isomer	550
0.96	heptadecene	∿43
0.97	n-heptadecane	110
0.97	∿C_{18} alkane isomer (tentative)	NQ
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	∿22
1.03	n-octadecane	43
1.04	∿C_{14} alkane isomer (tentative)	NQ
1.09	n-nonadecane	75
1.15	n-eicosane	110
1.20	n-heneicosane	55
1.25	docosene	∿15
1.26	n-docosane	56
1.31	n-tricosane	71
1.35	n-tetracosane	69
1.40	n-pentacosane	95
1.46	n-hexacosane	100
1.54	n-heptacosane	∿120
1.63	n-octacosane	∿98
1.73	n-nonacosane	∿120
1.87	C_{30} alkane isomer	∿64
2.05	C_{31} alkane isomer	∿72

*Relative to the internal standard D-10 anthracene.

TABLE C93. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #10(61:43) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	7600
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~370
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~1700
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~670
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~1100
0.44	TMS-phenol	470
0.45	TMS-$C_6H_{10}O_2$ acid isomer	~420
0.45	TMS- ~C_6 acid derivative (tentative)	NQ
0.47	TMS-n-hexanoic acid	11000
0.47	TMS-aminophenol (tentative)	NQ
0.49	TMS- ~C_6-C_7 acid derivative (tentative)	NQ
0.50	TMS derivatization artifact + TMS- ~C_7 acid derivative (tentative)	NQ
0.51	TMS-o-cresol	22
0.52	TMS- ~C_7 acid derivative (tentative)	NQ
0.52	unknown	
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~620
0.56	TMS-n-heptanoic acid	~12000
0.57	TMS- ~C_8 acid derivative (tentative)	NQ
0.57	TMS-$C_7H_{12}O_2$ acid isomer	~470
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~520
0.60	unknown	
0.61	TMS-$C_8H_{14}O_2$ acid isomer	~600
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	~630
0.63	unknown	
0.64	TMS-n-octanoic acid	11000
0.65	TMS- ~C_8 acid derivative (tentative)	NQ
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~870
0.68	TMS-3-nitrophenol	~1600
0.69	unknown	
0.70	TMS-p-toluic acid + TMS-$C_{10}H_{18}O_2$ acid isomer	~1100
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~1300
0.72	TMS-n-nonanoic acid	8700
0.73	unknown	
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~480
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	~1400
0.80	TMS-n-decanoic acid	6600
0.80	unknown	
0.81	unknown	
0.83	TMS- ~C_{10} acid derivative (tentative)	NQ
0.86	TMS- ~C_{11} acid derivative (tentative)	NQ

(continued)

TABLE C93. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.86	TMS-n-undecanoic acid	∿2000
0.87	unknown	
0.88	unknown	
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.93	TMS-$C_{12}H_{22}O_2$ acid isomer	∿730
1.00	D-10 ANTHRACENE	IS
1.04	TMS- ∿C_{13} acid derivative (tentative)	NQ
1.31	n-tricosane	51
1.35	n-tetracosane	43
1.41	n-pentacosane	92
1.46	n-hexacosane	79
1.54	n-heptacosane	∿85
1.62	n-octacosane	∿68

*Relative to the internal standard D-10 anthracene.

TABLE C94. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #10(61:43) B/N.

Relative Response Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿1900
0.38	unknown	
0.39	trimethylpyridine isomer	∿275
0.40	n-decane	250
0.40	unknown	
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.42	branched alkane (tentative)	NQ
0.44	TMS-phenol	760
0.44	TMS derivatization artifact + $C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿31
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.48	undecene	∿320
0.49	isophorone	460
0.49	n-undecane	320
0.50	TMS derivatization artifact	
0.51	$C_9H_{13}N$ isomer (tentative)	NQ
0.51	TMS-o-cresol	∿360
0.52	TMS-m-cresol	∿500
0.53	TMS-p-cresol	420
0.57	TMS-C_7H_9NO isomer	NQ
0.57	dodecene	∿230
0.58	n-dodecane	380
0.60	TMS-C_2 alkylphenol isomer	∿210
0.61	TMS-C_2 alkylphenol isomer	∿98
0.62	TMS-C_2 alkylphenol isomer	∿66
0.63	unknown	
0.65	C_{13} branched alkane	∿430
0.66	tridecene	∿100
0.67	n-tridecane	290
0.68	unknown	
0.69	unknown	
0.69	TMS-alkylphenol isomer (tentative)	NQ
0.70	TMS-alkylphenol isomer (tentative)	NQ
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿170
0.72	TMS-nitrophenol iosmer	∿550
0.73	C_{14} branched alkane	∿280
0.74	tetradecene	∿170
0.75	TMS-nitrophenol isomer	∿320
0.75	n-tetradecane	230
0.79	TMS-n-decanoic acid	360
0.80	C_{15} branched alkane	∿630

(continued)

TABLE C94. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.82	pentadecene	∿160
0.83	n-pentadecane	480
0.86	TMS-n-undecanoic acid	∿360
0.89	hexadecene	∿150
0.90	n-hexadecane	320
0.93	unknown	
0.93	C_{17} branched alkane	∿310
0.96	heptadecene	∿140
0.97	n-heptadecane	340
0.97	∿C_{18} branched alkane (tentative)	NQ
0.98	∿C_{18} alkene (tentative)	NQ
0.99	TMS-$C_{13}H_{26}O_2$ acid isomer	∿36
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	∿65
1.03	n-octadecane	150
1.04	C_{19} branched alkane	∿160
1.08	nonadecene	∿57
1.09	n-nonadecane	210
1.11	C_{20} branched alkane	∿34
1.14	eicosene	∿60
1.15	n-eicosane	170
1.19	C_{21} branched alkane	∿22
1.20	heneicosene	∿39
1.20	n-heneicosane	190
1.23	C_{22} branched alkane	∿10
1.25	docosene	∿61
1.26	n-docosane	150
1.30	tricosene	∿29
1.31	n-tricosane	160
1.34	C_{24} branched alkane	∿23
1.35	tetracosene	∿19
1.35	n-tetracosane	150
1.40	pentacosene	∿15
1.41	n-pentacosane	230
1.46	hexacosene	∿48
1.47	n-hexacosane	180
1.54	n-heptacosane	∿240
1.63	n-octacosane	∿200
1.74	n-nonacosane	∿300
1.88	n-triacontane	∿130
2.05	n-hentriacontane	∿180

*Relative to the internal standard D-10 anthracene.

TABLE C95. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #11(65:76) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	17000
0.39	unknown	
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~4200
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~1100
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~1900
0.44	TMS-phenol	1200
0.45	TMS-$C_6H_{10}O_2$ acid isomer	~900
0.46	TMS-$C_6H_{10}O_2$ acid isomer	~1500
0.47	TMS-n-hexanoic acid	>20000
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	~2200
0.49	TMS-$C_6H_{10}O_2$ acid isomer	~760
0.50	TMS-branched $C_7H_{14}O_2$ acid isomer	~20
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	120
0.52	TMS-branched $C_7H_{14}O_2$ acid isomer	~2700
0.52	TMS-p-cresol + TMS-branched $C_7H_{14}O_2$ acid isomer	~2300
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~1300
0.56	TMS-n-heptanoic acid	>20000
0.56	unknown	
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	~2700
0.58	TMS-$C_7H_{12}O_2$ acid isomer	~720
0.59	TMS-$C_7H_{12}O_2$ acid isomer	~320
0.59	TMS-branched $C_8H_{16}O_2$ acid isomer	~780
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~900
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer + unknown	~1200
0.61	TMS-$C_8H_{14}O_2$ acid isomer	~2500
0.63	TMS-$C_8H_{14}O_2$ acid isomer + unknown	~6600
0.64	TMS-n-octanoic acid	>20000
0.65	TMS-$C_8H_{14}O_2$ acid isomer + unknown	~2200
0.66	unknown	
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~2900
0.68	TMS-2-nitrophenol	2000
0.69	TMS-$C_{10}H_{18}O_2$ acid isomer + unknown	~2400
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	~800
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~3100
0.72	TMS-n-nonanoic acid	>20000
0.74	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~480
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	~380
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~640
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~880
0.76	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~540
0.76	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~280

(continued)

TABLE C95. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.77	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿600
0.77	TMS-branched $C_{11}H_{22}O_2$ acid isomer	∿300
0.78	TMS-$C_{11}H_{20}O_2$ acid isomer + unknown	∿280
0.79	TMS-$C_{16}H_{30}O$ derivative (tentative)	NQ
0.80	TMS-n-decanoic acid	10000
0.80	unknown	
0.81	unknown	
0.81	unknown	
0.83	TMS-branched $C_{12}H_{24}O_2$ acid isomer	∿1500
0.83	TMS-branched $C_{12}H_{24}O_2$ acid isomer + unknown	∿520
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	∿300
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	∿280
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	∿2700
0.87	TMS-branched $C_{11}H_{20}O_2$ acid isomer	∿7400
0.87	unknown	
0.89	unknown	
0.92	TMS-n-undecanoic acid	∿380
0.93	TMS-$C_{12}H_{22}O_2$ acid isomer	∿320
0.93	unknown	
0.93	TMS-$C_{13}H_{24}O_2$ acid isomer	∿1900
0.96	TMS-$C_{13}H_{24}O_2$ acid isomer	∿160
0.97	TMS-$C_{12}H_{22}O_2$ acid isomer	∿300
0.97	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿120
0.98	TMS-n-dodecanoic acid	400
1.00	D-10 ANTHRACENE	IS
1.04	TMS-n-tridecanoic acid	∿1200
1.30	n-tricosane	40
1.35	n-tetracosane	60
1.41	n-pentacosane	100
1.46	n-hexacosane	100
1.54	n-heptacosane	∿260

*Relative to the internal standard D-10 anthracene.

TABLE C96. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #11(65:76) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿5500
0.38	trimethylpyridine isomer	∿5400
0.38	unknown	
0.39	trimethylpyridine isomer + unknown	∿2500
0.39	trimethylpyridine isomer	∿3700
0.40	n-decane	1700
0.41	$C_7H_{10}O$ ketone (tentative) + unknown	NQ
0.42	$C_7H_{10}O$ ketone (tentative)	NQ
0.43	unknown	
0.44	TMS-phenol	4300
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.46	trimethylpyridine isomer	∿290
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	TMS-aminophenol isomer (tentative) + unknown	NQ
0.48	TMS-aminophenol isomer (tentative)	NQ
0.48	undecene	∿2000
0.49	isophorone	3500
0.49	n-undecane	1600
0.50	TMS-thiophenol isomer (tentative)	NQ
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	∿3500
0.52	TMS-m-cresol	∿3600
0.53	TMS-p-cresol	2800
0.55	TMS-C_7H_9NO isomer (tentative)	NQ
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.57	TMS-aminocresol isomer (tentative)	NQ
0.58	unknown	
0.58	n-dodecane	1200
0.59	TMS-C_2 alkylphenol isomer	∿99
0.60	TMS-C_2 akkylphenol isomer	∿1100
0.61	TMS-C_2 alkylphenol isomer	∿570
0.62	TMS-C_2 alkylphenol isomer	∿450
0.62	unknown	
0.63	TMS-C_2 alkylphenol isomer	∿59
0.65	unknown	
0.66	tridecene	∿360
0.67	n-tridecane	2100
0.68	TMS-C_4 alkylphenol isomer (tentative)	NQ
0.68	unknown	
0.69	unknown	
0.70	unknown	
0.70	unknown	
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿930

(continued)

TABLE C96. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.72	TMS-nitrophenol isomer	∿3400
0.73	unknown	
0.74	tetradecene	∿760
0.75	TMS-nitrophenol isomer	∿1800
0.75	n-tetradecane	1000
0.77	TMS-nitrophenol isomer + unknown	∿370
0.79	alkene (tentative) + unknown	NQ
0.79	TMS-n-decanoic acid	2200
0.80	unknown	
0.82	unknown	
0.82	pentadecene	∿430
0.83	n-pentadecane	1300
0.83	unknown	
0.84	unknown	
0.85	unknown	
0.86	TMS-n-undecanoic acid	∿1200
0.87	unknown	
0.88	unknown	
0.89	hexadecene	∿170
0.90	n-hexadecane	780
0.91	unknown	
0.93	unknown	
0.94	unknown	
0.95	unknown	
0.96	heptadecene	∿220
0.96	n-heptadecene	970
0.97	C_{18} branched alkane	∿500
0.98	alkene (tentative)	NQ
0.99	TMS-n-tridecanoic acid	∿300
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.02	octadecene	∿150
1.03	n-octadecane	450
1.04	C_{19} branched alkane	∿610
1.06	TMS-$C_{14}H_{28}O_2$ acid isomer	∿560
1.06	unknown	
1.08	nonadecene	∿110
1.09	n-nonadecane	580
1.14	eicosene	∿230
1.14	n-eicosane	870
1.16	unknown	
1.19	C_{21} branched alkane	∿100
1.19	heneicosene	∿88
1.20	n-heneicosane	640

(continued)

TABLE C96. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.25	docosene	~110
1.25	n-docosane	510
1.30	tricosene	~120
1.30	n-tricosane	540
1.35	tetracosene	~160
1.35	n-tetracosane	560
1.40	pentacosene	~200
1.40	n-pentacosane	940
1.46	hexacosene	~160
1.46	n-hexacosane	750
1.54	n-heptacosane	~760
1.62	n-octacosane	~610
1.74	n-nonacosane	~900
1.88	n-triacontane	~460
2.05	n-hentriacontane	~530

*Relative to the internal standard D-10 anthracene.

TABLE C97. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #12(70:00) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	5400
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	∿390
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	∿1100
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	∿450
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	∿800
0.45	TMS-phenol	380
0.45	TMS derivatization artifact	
0.45	TMS- $\sim C_6$ acid derivative (tentative)	NQ
0.47	TMS-n-hexanoic acid	8000
0.47	TMS- $\sim C_6$ acid derivative (tentative)	NQ
0.49	TMS- $\sim C_7$ acid derivative (tentative)	NQ
0.51	TMS- $\sim C_7$ acid derivative (tentative) + TMS derivatization artifact	NQ
0.51	TMS-o-cresol	190
0.52	TMS- $\sim C_7$ acid derivative (tentative)	NQ
0.52	TMS-nitrosophenol isomer (tentative)	NQ
0.53	TMS-p-cresol	110
0.54	TMS-$C_7H_{12}O_2$ acid isomer	∿530
0.56	TMS-n-heptanoic acid	>20000
0.57	TMS- $\sim C_7$ acid derivative (tentative)	NQ
0.58	TMS-$C_7H_{12}O_2$ acid isomer	∿360
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿390
0.60	TMS-acid derivative (unknown) (tentative)	NQ
0.61	TMS- $\sim C_8$ acid derivative (tentative)	NQ
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	∿770
0.63	TMS-acid derivative (unknown) (tentative)	NQ
0.64	TMS-n-octanoic acid	11000
0.65	TMS-$C_9H_{18}O_2$ acid isomer	∿750
0.67	TMS-$C_9H_{18}O_2$ acid isomer	∿1300
0.68	TMS-3-nitrophenol	∿780
0.68	TMS- $\sim C_9$ acid derivative (tentative)	NQ
0.69	TMS-acid (unknown)	NQ
0.70	TMS-p-toluic acid + TMS-$C_{10}H_{18}O_2$ acid isomer	∿1100
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿2200
0.72	TMS-n-nonanoic acid	12100
0.73	unknown	
0.73	TMS-$C_{10}H_{20}O_2$ acid isomer	∿140
0.74	TMS- $\sim C_{10}$ acid derivative (tentative)	NQ
0.75	unknown	
0.77	TMS-$C_{10}H_{20}O_2$ acid isomer	∿230
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	∿2000
0.80	TMS-n-decanoic acid	8500

(continued)

TABLE C97. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.80	unknown	
0.81	unknown	
0.81	unknown	
0.83	TMS-acid derivative (unknown) (tentative)	NQ
0.84	TMS- ∿C_{11} acid derivative (tentative)	NQ
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	∿1100
0.87	TMS-n-undecanoic acid	∿3400
0.87	unknown	
0.88	unknown	
0.92	TMS-$C_{12}H_{22}O_2$ acid isomer	∿170
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.93	TMS-n-dodecanoic acid	1100
1.00	D-10 ANTHRACENE	IS
1.05	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿360
1.25	n-docosane	33
1.31	n-tricosane	48
1.36	n-tetracosane	64
1.41	n-pentacosane	96
1.47	n-hexacosane	91
1.54	n-heptacosane	∿91
1.63	n-octacosane	∿70

*Relative to the internal standard D-10 anthracene.

TABLE C98. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #12(70:00) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿8700
0.38	trimethylpyridine isomer	∿1700
0.38	decene + unknown	∿2500
0.39	trimethylpyridine isomer	∿120
0.40	n-decane	3200
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.42	$C_7H_{10}O$ ketone (tentative)	NQ
0.42	branched alkane (tentative)	NQ
0.44	TMS-phenol	2200
0.44	trimethylpyridine isomer	∿1600
0.44	TMS derivatization artifact +	
	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿310
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.48	undecene	∿2300
0.48	isophorone	120
0.49	n-undecane	2300
0.50	TMS-thiophenol isomer (tentative)	NQ
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	∿2300
0.52	TMS-m-cresol	∿1700
0.53	TMS-p-cresol	1300
0.54	naphthalene	∿5100
	alkene (tentative)	NQ
0.55	alkene (tentative) +	NQ
	TMS-nitrosophenol isomer (tentative)	NQ
0.57	dodecene	∿2500
0.58	TMS-nitrosophenol isomer (tentative)	NQ
0.58	n-dodecane	2600
0.59	TMS-aminophenol isomer (tentative)	NQ
0.60	TMS-C_2 alkylphenol isomer	∿1300
0.60	TMS-C_2 alkylphenol isomer	∿260
0.61	TMS-C_2 alkylphenol isomer	∿300
0.62	unknown	
0.63	unknown	
0.64	phthalate (tentative)	NQ
0.65	C_{13} branched alkane	∿1500
0.66	tridecene	∿510
0.66	∿C_{13} alkene (tentative)	NQ
0.67	n-tridecane	1800
0.67	TMS-nitrophenol isomer	∿480
0.68	unknown	
0.69	unknown	

(continued)

TABLE C98. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.70	unknown	
0.70	unknown	
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿680
0.72	TMS-nitrophenol isomer	∿1300
0.73	C_{14} branched alkane	∿1500
0.74	tetradecene	∿360
0.75	TMS-nitrophenol isomer	∿1100
0.75	n-tetradecane	1200
0.76	unknown	
0.77	unknown	
0.78	unknown	
0.79	unknown	
0.79	TMS-n-decanoic acid	1500
0.80	C_{15} branched alkane	∿1300
0.81	unknown	
0.82	pentadecene	∿1100
0.83	n-pentadecane	2200
0.84	unknown	
0.85	unknown	
0.86	unknown	
0.87	TMS-n-undecanoic acid	∿1900
0.87	unknown	
0.88	unknown	
0.89	unknown	
0.89	hexadecene	∿460
0.90	n-hexadecane	2400
0.91	unknown	
0.93	unknown	
0.93	TMS-n-dodecanoic acid	1700
0.94	C_{17} branched alkane	∿320
0.96	unknown	
0.96	heptadecene	∿770
0.96	n-heptadecane	2000
0.98	C_{18} branched alkane	∿880
0.99	unknown	
0.99	$\sim C_{18}$ alkene (tentative)	NQ
0.99	$\sim C_{18}$ alkene (tentative)	NQ
1.00	unknown + D-10 ANTHRACENE	IS
1.01	unknown	
1.02	unknown	
1.03	octadecene	∿420
1.03	n-octadecane	920
1.04	C_{19} branched alkane	∿770

(continued)

TABLE C98. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.06	unknown	
1.06	TMS-$C_{14}H_{28}O_2$ acid isomer	∿720
1.09	nonadecene	∿310
1.10	n-nonadecane	1200
1.10	∿C_{20} alkene (tentative)	NQ
1.12	C_{20} branched alkene	∿96
1.13	C_{20} branched alkene	∿180
1.14	∿C_{20} alkene (tentative) + unknown	NQ
1.15	eicosene	∿260
1.15	n-eicosane	990
1.16	∿C_{21} alkene (tentative) + unknown	NQ
1.19	C_{22} branched alkane	∿81
1.20	C_{22} branched alkane	∿100
1.20	docosene	∿180
1.21	n-docosane	810
1.23	C_{23} branched alkane	∿67
1.24	C_{23} branched alkane	∿6
1.26	tricosene	∿150
1.26	n-tricosene	660
1.28	C_{24} branched alkane	∿160
1.29	C_{24} branched alkane	∿130
1.31	tetracosene	∿100
1.31	n-tetracosane	770
1.33	C_{25} branched alkane	∿160
1.34	C_{25} branched alkane	∿100
1.36	pentacosene	∿150
1.36	n-pentacosane	700
1.39	C_{26} branched alkane	∿150
1.41	hexacosene	∿180
1.41	n-hexacosane	1100
1.43	bis-(2-ethylhexyl)phthalate	60
1.44	C_{17} branched alkane	∿170
1.46	heptacosene	∿13
1.47	n-heptacosane	∿760
1.52	octacosene	∿8
1.53	n-octacosane	∿1000
1.56	phthalate (tentative)	NQ
1.60	nonacosene	∿11
1.60	n-nonacosane	∿820
1.68	triacontene	∿110
1.70	n-triacontane	∿120
1.73	hentriacontene	∿39
1.82	n-hentriacontane	∿390
1.95	dotriacontene	∿84
1.97	n-dotriacontane	∿600
2.16	C_{33} branched alkane	∿4

*Relative to the internal standard D-10 anthracene.

TABLE C99. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #13(74:23) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	8100
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	~2500
0.41	TMS-branched $C_7H_{14}O_2$ acid isomer	~120
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	~460
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	~980
0.45	TMS-phenol	500
0.47	TMS-n-hexanoic acid	11000
0.47	TMS-aminophenol isomer (tentative)	NQ
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	~400
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	100
0.52	TMS-branched $C_7H_{14}O_2$ acid isomer	~1400
0.52	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~2300
0.56	TMS-n-heptanoic acid	~17000
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	~1100
0.58	TMS-$C_7H_{12}O_2$ acid isomer	~700
0.59	TMS-branched $C_8H_{16}O_2$ acid isomer	~460
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~400
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer + unknown	~660
0.61	TMS-$C_8H_{14}O_2$ acid siomer	~440
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	~320
0.63	TMS-branched $C_8H_{16}O_2$ acid isomer + unknown	~4000
0.64	TMS-n-octanoic acid	12000
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer (tentative)	NQ
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~1500
0.68	TMS-2-nitrophenol	2000
0.69	unknown	
0.70	TMS-p-toluic acid + unknown	~1100
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~2500
0.72	TMS-n-nonanoic acid	14000
0.73	TMS-$C_9H_{16}O_2$ acid isomer	~1200
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~220
0.74	unknown	
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	~120
0.75	TMS-$C_{10}H_{18}O_2$ acid isomer	~260
0.75	TMS-$C_9H_{16}O_2$ acid isomer	~740
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~240
0.76	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~260
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	~2500
0.80	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~9900
0.80	unknown	
0.81	unknown	

(continued)

TABLE C99. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.82	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~120
0.83	TMS-$C_{10}H_{18}O_2$ acid isomer	~520
0.83	TMS-branched $C_{12}H_{24}O_2$ acid isomer + unknown	~220
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	~1300
0.87	n-undecanoic acid	~3300
0.87	unknown	
0.88	unknown	
0.91	unknown	
0.92	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~280
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.93	unknown	
0.98	TMS-branched $C_{12}H_{24}O_2$ acid isomer	~240
1.00	D-10 ANTHRACENE	IS
1.04	TMS-branched $C_{13}H_{26}O_2$ acid isomer	~560
1.35	n-tetracosane	40
1.41	n-pentacosane	80
1.46	n-hexacosane	60

*Relative to the internal standard D-10 anthracene.

TABLE C100. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #13(74:23) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	unknown	
0.37	trimethylpyridine isomer	~2700
0.38	trimethylpyridine isomer	~4100
0.39	trimethylpyridine isomer	~350
0.40	unknown + trimethylpyridine isomer	~800
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.41	unknown	
0.44	TMS-phenol	3100
0.45	$C_9H_{13}N$ isomer (tentative) + trimethylpyridine isomer	NQ ~2000
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.46	trimethylpyridine isomer	~230
0.46	unknown	
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	unknown + undecene	~800
0.49	isophorone	930
0.50	TMS-thiophenol isomer (tentative)	NQ
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	~2600
0.52	TMS-m-cresol	~1900
0.53	TMS-p-cresol	1900
0.54	unknown	
0.55	TMS-nitrosophenol isomer (tentative)	NQ
0.56	TMS-nitrosophenol isomer (tentative)	NQ
0.57	TMS-C_7H_9NO isomer (tentative)	NQ
0.58	unknown	
0.58	n-dodecane	42
0.59	TMS-C_2 alkylphenol isomer	~140
0.60	TMS-C_2 alkylphenol isomer	~1200
0.61	TMS-C_2 alkylphenol isomer	~440
0.62	TMS-C_2 alkylphenol isomer	~400
0.62	unknown	
0.63	unknown	
0.64	TMS-C_3 alkylphenol isomer	~810
0.67	tridecene + unknown	~1100
0.67	TMS-nitrophenol isomer	~1500
0.68	unknown	
0.69	unknown	
0.69	TMS-C_3 alkylphenol isomer	~130
0.70	TMS-C_3 alkylphenol isomer	~230
0.70	~C_4 alkylphenol isomer (tentative)	NQ
0.71	TMS-n-nonanoic acid	820
0.72	TMS-nitrophenol isomer	~2300
0.73	unknown	

(continued)

TABLE C100. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.74	tetradecene + unknown	$\sim$170
0.75	unknown	
0.77	unknown	
0.78	unknown	
0.79	unknown + $\sim C_{15}$ alkene (tentative)	NQ
0.82	unknown	
0.82	unknown + $\sim C_{15}$ alkene (tentative)	NQ
0.83	n-pentadecane	87
0.84	unknown	
0.84	unknown	
0.85	unknown	
0.86	unknown	
0.87	TMS-n-undecanoic acid	$\sim$2600
0.87	unknown	
0.88	unknown	
0.89	unknown	
0.90	unknown	
0.90	unkonwn + n-hexadecane	$\sim$350
0.91	unknown	
0.93	unknown	
0.93	TMS-n-dodecanoic acid	3500
0.95	unknown	
0.96	unknown	
0.97	n-heptadecane	560
0.98	$\sim C_{18}$ alkane (tentative)	NQ
0.99	$\sim C_{18}$ alkene (tentative) + unknown	NQ
1.00	unknown acid + D-10 ANTHRACENE	IS
1.02	unknown	
1.03	n-octadecane	170
1.04	$\sim C_{19}$ alkane (tentative)	NQ
1.06	unknown	
1.09	n-nonadecane	320
1.14	n-eicosane	390
1.20	n-heneicosane	220
1.26	docosene	$\sim$40
1.26	n-docosane	170
1.30	n-tricosane	210
1.35	tetracosene	$\sim$39
1.35	n-tetracosane	220
1.40	n-pentacosane	350
1.46	n-hexacosane	360
1.54	n-heptacosane	$\sim$340
1.62	n-octacosane	$\sim$300
1.74	n-nonacosane	$\sim$400
1.81	C_{30} alkane isomer	$\sim$220
1.96	C_{31} alkane isomer	$\sim$320

*Relative to the internal standard D-10 anthracene.

TABLE C101. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #14(74:23) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	20000
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	~940
0.41	TMS-branched $C_6H_{12}O_2$ acid isomer	~3200
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	~1500
0.44	TMS-branched $C_6H_{12}O_2$ acid isomer	~2000
0.45	TMS-phenol	530
0.45	TMS-branched $C_6H_{12}O_2$ acid isomer + unknown	~910
0.46	TMS-branched $C_7H_{14}O_2$ acid isomer	~1800
0.47	TMS-n-hexanoic acid	>20000
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-aminophenol isomer (tentative)	NQ
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	~1700
0.51	TMS derivatization artifact	
0.52	TMS-$C_7H_{12}O_2$ acid isomer + TMS-branched $C_7H_{14}O_2$ acid isomer	~2200
0.52	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~1700
0.56	TMS-n-heptanoic acid	>20000
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	~3000
0.58	TMS-$C_7H_{12}O_2$ acid isomer	~720
0.58	TMS-nitrosophenol isomer (tentative)	NQ
0.59	TMS-branched $C_8H_{16}O_2$ acid isomer + TMS-nitrosophenol isomer (tentative)	~860 NQ
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~1300
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer + TMS-C_2 alkylphenol (tentative)	~1700 NQ
0.61	TMS-$C_8H_{14}O_2$ acid isomer + TMS-branched $C_8H_{16}O_2$ acid isomer	~1400
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	~1000
0.63	TMS-$C_8H_{14}O_2$ acid isomer	~8900
0.64	TMS-n-octanoic acid	>20000
0.65	TMS-$C_8H_{14}O_2$ acid isomer	~990
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	~1700
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~3100
0.68	TMS-3-nitrophenol	~4600
0.69	unknown	
0.70	TMS-p-toluic acid	2600
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~5400
0.73	TMS-n-nonanoic acid	>20000
0.73	TMS-$C_9H_{16}O_2$ acid isomer	~2300
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	~430
0.75	TMS-$C_9H_{16}O_2$ acid isomer	~570
0.75	TMS- ~C_9 acid derivative (tentative)	NQ
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~540

(continued)

TABLE C101. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.77	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿370
0.77	unknown	
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	∿5700
0.80	TMS-n-decanoic acid	18000
0.80	TMS-$C_{10}H_{18}O_2$ acid isomer	∿1000
0.82	TMS-branched $C_{11}H_{22}O_2$ acid isomer + unknown	∿250
0.83	TMS-$C_{10}H_{18}O_2$ acid isomer + TMS-branched $C_{11}H_{22}O_2$ acid isomer	∿2000
0.83	unknown	
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	∿2800
0.87	TMS-n-undecanoic acid	∿7100
0.87	unknown	
0.89	unknown	
0.92	TMS-branched $C_{11}H_{22}O_2$ acid isomer	∿410
0.93	TMS-$C_{12}H_{22}O_2$ acid isomer	∿200
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.93	TMS-$C_{12}H_{22}O_2$ acid isomer	∿2300
0.94	TMS- $\sim C_{12}$ acid isomer (tentative) + unknown	NQ
0.96	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿810
0.99	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿2600
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.04	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿890
1.06	TMS-n-tetradecanoic acid	∿7300
1.08	TMS-branched $C_{15}H_{30}O_2$ acid isomer	∿720
1.10	TMS-$C_{15}H_{30}O_2$ isomer	∿270
1.10	TMS-branched $C_{15}H_{30}O_2$ acid isomer	∿1600
1.12	TMS-n-pentadecanoic acid	∿4200
1.14	TMS-branched $C_{16}H_{32}O_2$ acid isomer	∿430
1.16	TMS-$C_{16}H_{30}O_2$ acid isomer	∿8100
1.18	TMS-n-hexadecanoic acid	>20000
1.19	TMS-branched $C_{17}H_{34}O_2$ acid isomer	∿670
1.21	TMS-branched $C_{18}H_{36}O_2$ acid isomer	∿1400
1.22	TMS-n-heptadecanoic acid	∿1900
1.26	TMS-$C_{18}H_{34}O_2$ acid isomer	>20000
1.29	TMS-n-octadecanoic acid	>20000
1.31	n-tricosane	91
1.33	TMS-branched $C_{20}H_{40}O_2$ acid isomer	∿590
1.36	n-tetracosane	120
1.38	TMS-n-eicosanoic acid	∿1300
1.41	n-pentacosane	260
1.44	unknown	
1.46	n-hexacosane + unknown	∿700
1.51	unknown	

(continued)

TABLE C101. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.54	n-heptacosane	∿240
1.59	unknown	
1.62	unknown	

*Relative to the internal standard D-10 anthracene.

TABLE C102. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #14(74:23) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	∿310
0.38	trimethylpyridine isomer	∿1200
0.39	decene	∿860
0.40	n-decane	1500
0.40	trimethylbenzene isomer	∿9400
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.42	branched alkane (tentative)	NQ
0.44	TMS-phenol	770
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	∿30
0.46	$C_9H_{13}N$ isomer (tentative) + TMS derivatization artifact	NQ
0.47	unknown + TMS-aminophenol isomer (tentative)	NQ
0.48	undecene	∿1200
0.49	isophorone	740
0.49	n-undecane	1600
0.50	TMS-thiophenol (tentative) + unknown	NQ
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	∿550
0.52	TMS-m-cresol	∿580
0.53	TMS-p-cresol	340
0.54	C_{12} branched alkane	∿59
0.55	C_{12} branched alkane	∿74
0.56	TMS-nitrosophenol isomer (tentative) + branched alkane (tentative)	NQ NQ
0.57	dodecene	∿850
0.58	unknown	
0.58	n-dodecane	1500
0.59	alkene (tentative) + TMS-C_2 alkylphenol isomer	NQ ∿29
0.60	branched alkane (tentative) + TMS-C_2 alkylphenol isomer	NQ ∿370
0.60	unknown	
0.61	TMS-C_2 alkylphenol isomer	∿30
0.61	alkene (tentative)	NQ
0.62	TMS-C_2 alkylphenol isomer	∿70
0.62	unknown	
0.63	unknown	
0.65	C_{13} branched alkane	∿810
0.66	tridecene	∿400
0.66	∿C_{13} alkene (tentative)	NQ
0.67	n-tridecane	940
0.68	TMS-nitrophenol isomer	∿380

(continued)

TABLE C102. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.69	unknown	
0.69	unknown + TMS-C_3 alkylphenol isomer	∿17
0.70	TMS-∿C_4 alkylphenol isomer (tentative)	NQ
0.71	unknown + TMS-n-nonanoic acid	∿390
0.72	TMS-nitrophenol isomer	∿420
0.73	C_{14} branched alkane	∿12
0.73	C_{14} branched alkane	∿410
0.74	tetradecene	∿250
0.75	n-tetradecane	900
0.76	trimethylpyridine isomer	∿74
0.78	∿C_{15} alkene (tentative) + unknown	NQ
0.78	unknown	
0.79	TMS-n-decanoic acid	580
0.80	C_{15} branched alkane	∿1400
0.81	∿C_{15} alkene (tentative)	NQ
0.82	pentadecene	∿630
0.83	n-pentadecane	1500
0.83	unknown	
0.84	trimethylpyridine isomer	∿20
0.84	unknown	
0.85	unknown	
0.86	TMS-n-undecanoic acid	∿570
0.87	C_{16} branched alkane	∿240
0.87	unknown	
0.89	∿C_{16} alkene (tentative) + unknown	NQ
0.89	hexadecene	∿500
0.90	n-hexadecane	1200
0.91	∿C_{17} alkene (tentative) + unknown	NQ
0.93	unknown	
0.93	C_{17} branched alkane	∿490
0.94	∿C_{17} alkene (tentative)	NQ
0.95	∿C_{17} alkene (tentative) + unknown	NQ
0.95	∿C_{17} alkene (tentative) + unknown	NQ
0.96	heptadecene	∿470
0.97	n-heptadecane	1200
0.97	C_{18} branched alkane	∿490
0.98	∿C_{18} alkene (tentative)	NQ
0.99	∿C_{18} alkene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.02	alkene (tentative)	NQ
1.02	octadecene	∿250
1.03	n-octadecane	570
1.04	C_{19} branched alkane	∿440
1.06	∿C_{19} alkene (tentative) + unknown	NQ

(continued)

TABLE C102. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.06	$\sim C_{19}$ alkene (tentative)	NQ
1.07	$\sim C_{19}$ alkene (tentative)	NQ
1.08	$\sim C_{19}$ alkene (tentative)	NQ
1.08	nonadecene	~140
1.09	n-nonadecane	620
1.10	$\sim C_{20}$ alkene (tentative)	NQ
1.11	$\sim C_{20}$ alkene (tentative)	NQ
1.12	$\sim C_{20}$ alkene (tentative)	NQ
1.13	$\sim C_{20}$ alkene (tentative)	NQ
1.14	eicosene	~160
1.15	n-eicosane	510
1.19	$\sim C_{21}$ alkene (tentative)	NQ
1.19	C_{21} branched alkane	~44
1.20	heneicosene	~110
1.20	n-heneicosane	470
1.22	C_{22} branched alkane	~27
1.23	C_{22} branched alkane	~24
1.25	docosene	~81
1.25	n-docosane	330
1.27	$\sim C_{23}$ alkene (tentative) + unknown	NQ
1.28	$\sim C_{23}$ alkene (tentative) + unknown	NQ
1.29	$\sim C_{23}$ alkene (tentative)	NQ
1.30	tricosene	~37
1.31	n-tricosane	380
1.31	$\sim C_{24}$ alkene (tentative)	NQ
1.32	C_{24} branched alkane	~11
1.33	C_{24} branched alkane	~57
1.35	tetracosene	~49
1.35	n-tetracosane	290
1.38	C_{25} branched alkane	~46
1.40	pentacosene	~26
1.41	n-pentacosane	430
1.44	$\sim C_{26}$ alkene (tentative)	NQ
1.46	hexacosene	~160
1.47	n-hexacosane	510
1.51	C_{27} branched alkane	~53
1.54	n-heptacosane	~680
1.62	octacosene	~20
1.63	n-octacosane	~470
1.74	n-nonacosane	610
1.88	n-triacontane	~230
2.06	n-hentriacontane	~290
2.28	C_{32} alkane	~7

*Relative to the internal standard D-10 anthracene.

TABLE C103. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #15(76:38) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS-branched $C_5H_{10}O_2$ acid isomer	∿720
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	13000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿1100
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿2400
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿830
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿1400
0.44	TMS-phenol	440
0.45	TMS- ∿C_6 acid derivative (tentative)	NQ
0.47	TMS-n-hexanoic acid	16000
0.47	TMS-aminophenol isomer (tentative)	NQ
0.49	TMS- ∿C_7 acid derivative (tentative)	NQ
0.50	TMS derivatization artifact	
0.52	TMS- ∿C_7 acid derivative (tentative)	NQ
0.53	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	∿2600
0.56	TMS-n-heptanoic acid	∿20000
0.56	TMS-nitrosophenol isomer (tentative)	NQ
0.57	TMS- ∿C_8 acid derivative (tentative)	NQ
0.58	TMS-$C_7H_{12}O_2$ acid isomer	∿1000
0.58	TMS-nitrosophenol (tentative)	NQ
0.60	TMS- ∿C_8 acid derivative (tentative)	NQ
0.60	TMS- ∿C_8 acid derivative (tentative)	NQ
0.61	TMS- ∿C_8 acid derivative (tentative)	NQ
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.63	unknown	
0.64	TMS-n-octanoic acid	18000
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	∿460
0.67	TMS-$C_9H_{18}O_2$ acid isomer	∿1800
0.68	TMS-nitrophenol isomer	∿480
0.69	unknown	
0.70	TMS-p-toluic acid + TMS-$C_{10}H_{18}O_2$ acid isomer	∿1900
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿3800
0.72	TMS-n-nonanoic acid	19000
0.73	unknown	
0.75	TMS-acid, unknown (tentative)	NQ
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	∿3500
0.80	TMS-n-decanoic acid	13000
0.80	TMS-$C_{10}H_{18}O_2$ acid isomer	∿840
0.83	TMS-branched $C_{11}H_{22}O_2$ acid isomer	∿810
0.83	unknown	
0.84	TMS-branched $C_{11}H_{22}O_2$ acid isomer	∿110
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	∿1600
0.86	TMS-n-undecanoic acid	∿3700
0.87	unknown	

(continued)

TABLE C103. (continued)

Realtive Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.88	TMS-C_3 benzoic acid (tentative)	NQ
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.96	TMS- ∿C_{11} acid isomer (tentative)	NQ
0.98	TMS-branched $C_{12}H_{24}O_2$ acid isomer	∿220
1.00	D-10 ANTHRACENE	IS
1.02	TMS-acid, unknown (tentative)	NQ
1.04	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿560
1.06	TMS-n-tetradecanoic acid	∿590
1.17	TMS-n-hexadecanoic acid	∿5900
1.26	TMS-$C_{18}H_{34}O_2$ acid isomer	∿3400
1.26	TMS-$C_{18}H_{34}O_2$ acid isomer	∿3500
1.28	TMS-n-octadecanoic acid	∿5300
1.35	n-tetracosane	60
1.40	n-pentacosane	84
1.46	n-hexacosane	88

*Relative to the internal standard D-10 anthracene.

TABLE C104. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #15(76:38) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.38	trimethlypyridine isomer	~1200
0.38	decene	~210
0.39	trimethylpyridine isomer	~140
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	620
0.44	$C_9H_{13}N$ isomer (tentative)	NQ
0.45	trimethylpyridine isomer	~53
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	unknown + undecene	~220
0.48	isophorone	~260
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	~460
0.52	TMS-m-cresol	~500
0.53	TMS-p-cresol	370
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.57	TMS-C_7H_9NO isomer (tentative)	NQ
0.58	unknown	
0.58	TMS-C_2 alkylphenol isomer	~98
0.60	TMS-C_2 alkylphenol isomer	~190
0.61	TMS-C_2 alkylphenol isomer	~93
0.62	TMS-C_2 alkylphenol isomer	~62
0.63	unknown	
0.65	TMS-C_3 alkylphenol isomer	~410
0.65	unknown	
0.67	unknown	
0.68	unknown	
0.69	unknown	
0.70	TMS-C_3 alkylphenol isomer	~120
0.70	TMS-C_3 alkylphenol isomer	~130
0.71	TMS-$C_9H_{18}O_2$ acid isomer	~350
0.72	TMS-nitrophenol isomer	~1000
0.73	unknown	
0.75	TMS-nitrophenol isomer	~300
0.79	unknown	
0.79	TMS-n-decanoic acid	680
0.80	unknown	
0.83	n-pentadecane	17
0.86	TMS-n-undecanoic acid	~730
0.90	n-hexadecane	70
0.93	unknown	
0.95	unknown	
0.96	n-heptadecane	42
0.97	C_{18} branched alkane	~51
1.00	D-10 ANTHRACENE	IS

(continued)

TABLE C104. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.01	unknown	
1.04	n-octadecane	24
1.09	n-nonadecane	28
1.15	n-eicosane	43
1.20	n-heneicosane	28
1.25	n-docosane	23
1.30	n-tricosane	36
1.35	n-tetracosane	41
1.40	n-pentacosane	58
1.46	n-hexacosane	66
1.53	n-heptacosane	∿64
1.62	n-octacosane	∿55
1.73	n-nonacosane	∿59

*Relative to the internal standard D-10 anthracene.

TABLE C105. LAWRENCE LIVERMORE DERIVTIZED SAMPLE #16(76:38) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	15000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿3000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿40
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿540
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿1100
0.44	TMS-phenol	400
0.45	TMS-$C_6H_{10}O_2$ acid isomer	∿980
0.46	TMS-$C_6H_{10}O_2$ acid isomer	∿1300
0.47	TMS-n-hexanoic acid	19000
0.49	TMS-$C_6H_{10}O_2$ acid isomer + TMS-branched $C_7H_{14}O_2$ acid isomer	∿2200
0.51	TMS derivatization artifact	
0.52	TMS-$C_7H_{12}O_2$ acid isomer	∿2400
0.53	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	∿720
0.55	TMS-$C_7H_{12}O_2$ acid isomer	∿3000
0.56	TMS-n-heptanoic acid	>20000
0.56	TMS-$C_8H_{14}O_2$ acid isomer	∿2600
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	∿2000
0.58	TMS-$C_7H_{12}O_2$ acid isomer	∿640
0.59	TMS-branched $C_8H_{16}O_2$ acid isomer	∿980
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿920
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer	∿1300
0.61	TMS-$C_8H_{14}O_2$ acid isomer	∿1900
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	∿600
0.63	TMS-$C_8H_{14}O_2$ acid isomer	∿5600
0.64	TMS-n-octanoic acid	>20000
0.65	TMS-$C_8H_{14}O_2$ acid isomer	∿2000
0.66	TMS-$C_8H_{14}O_2$ acid isomer	∿360
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	∿2800
0.68	TMS-toluic acid isomer + TMS-$C_9H_{16}O_2$ acid isomer	∿3700
0.69	unknown	
0.70	TMS-p-toluic acid	2100
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿4600
0.72	TMS-n-nonanoic acid	>20000
0.73	TMS-$C_9H_{16}O_2$ acid isomer	∿2100
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿720
0.74	TMS-aminothiophenol isomer (tentative) + unknown	NQ
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	∿280
0.75	TMS-$C_9H_{16}O_2$ acid isomer	∿1700
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿760
0.77	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿380

(continued)

TABLE C105. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.78	unknown	
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	~4200
0.80	TMS-n-decanoic acid	1400
0.81	unknown	
0.83	TMS-$C_{10}H_{18}O_2$ acid isomer	~1200
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	~280
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	~220
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	~2000
0.86	TMS-n-undecanoic acid	~6000
0.87	unknown	
0.89	unknown	
0.92	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~360
0.92	TMS-$C_{12}H_{22}O_2$ acid isomer	~740
0.93	unknown	
0.94	unknown	
0.96	TMS-branched $C_{16}H_{32}O_2$ acid isomer	~570
0.98	TMS-branched $C_{12}H_{24}O_2$ acid isomer	~380
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.05	TMS-branched $C_{13}H_{26}O_2$ acid isomer	~1200
1.06	TMS-$C_{14}H_{28}O_2$ acid isomer	~220
1.17	TMS-n-hexadecanoic acid	~1800
1.26	TMS-$C_{18}H_{34}O_2$ acid isomer	~380
1.27	unknown	
1.28	TMS-$C_{18}H_{36}O_2$ acid isomer	~1400
1.35	n-tetracosane	60
1.40	n-pentacosane	100
1.46	n-hexacosane	120
1.54	n-heptacosane	~120

*Relative to the internal standard D-10 anthracene.

TABLE C106. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #16(76:38) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	trimethylpyridine isomer	∿310
0.38	trimethylpyridine isomer	∿800
0.39	trimethylpyridine isomer	∿42
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	480
0.45	$C_9H_{13}N$ isomer (tentative)	NQ
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.49	isophorone	310
0.50	TMS derivatization artifact	
0.51	$C_9H_{13}N$ isomer (tentative)	NQ
0.51	TMS-o-cresol	∿220
0.52	TMS-m-cresol	∿380
0.53	TMS-p-cresol	290
0.57	C_7H_9NO isomer (tentative)	NQ
0.59	TMS-C_2 alkylphenol isomer	∿55
0.60	TMS-C_2 alkylphenol isomer	∿130
0.61	TMS-C_2 alkylphenol isomer	∿69
0.62	TMS-C_2 alkylphenol isomer	∿53
0.62	unknown	
0.63	unknown	
0.64	TMS-C_3 alkylphenol isomer	∿270
0.67	TMS-nitrophenol isomer	∿56
0.68	unknown	
0.69	TMS-C_3 alkylphenol isomer	∿53
0.70	TMS-C_3 alkylphenol isomer	∿45
0.71	TMS-$C_9H_{18}O_2$ acid isomer	∿220
0.72	TMS-nitrophenol isomer	∿750
0.75	TMS-nitrophenol isomer	∿510
0.79	TMS-n-decanoic acid	570
0.86	TMS-n-undecanoic acid	∿570
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.93	TMS-$C_{12}H_{24}O_2$ acid isomer	660
0.96	TMS-$C_{13}H_{26}O_2$ acid isomer	∿69
1.00	D-10 ANTHRACENE	IS
1.30	n-tricosane	18
1.35	n-tetracosane	23
1.40	n-pentacosane	46
1.46	n-hexacosane	41
1.54	n-heptacosane	∿39
1.62	n-octacosane	∿33

*Relative to the internal standard D-10 anthracene.

TABLE C107. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #17(78:43) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	10000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿2300
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿80
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿600
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿820
0.44	TMS-phenol	260
0.45	TMS-$C_6H_{10}O_2$ acid isomer	∿680
0.46	TMS-$C_6H_{10}O_2$ acid isomer	∿820
0.47	TMS-n-hexanoic acid	14000
0.47	TMS-aminophenol isomer (tentative) + unknown	NQ
0.49	TMS-$C_6H_{10}O_2$ acid isomer + TMS-branched $C_7H_{14}O_2$ acid isomer	∿700
0.51	TMS derivatization artifact	
0.52	TMS-$C_7H_{12}O_2$ acid isomer + TMS-branched $C_7H_{14}O_2$ acid isomer	∿2500
0.52	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	∿80
0.55	TMS-$C_7H_{12}O_2$ acid isomer	∿2000
0.56	TMS-n-heptanoic acid	∿13000
0.56	TMS-nitrosophenol isomer (tentative)	NQ
0.57	unknown	
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	∿740
0.58	TMS-$C_7H_{12}O_2$ acid isomer	∿900
0.58	TMS-nitrosophenol isomer (tentative)	NQ
0.59	unknown	
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿800
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer + unknown	∿1100
0.61	TMS-$C_8H_{14}O_2$ acid isomer + TMS-branched $C_9H_{18}O_2$ acid isomer	∿560
0.61	TMS-methylbenzyl alcohol isomer (tentative)	NQ
0.65	TMS-n-octanoic acid	>20000
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	∿1900
0.66	TMS-$C_{10}H_{18}O_2$ acid isomer	∿160
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	∿2100
0.68	TMS-$C_9H_{16}O_2$ acid isomer	∿2000
0.69	TMS-$C_{10}H_{18}O_2$ acid isomer	∿2000
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	∿1500
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿3300
0.72	TMS-n-nonanoic acid	19000
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿200
0.74	TMS-C_3 aminophenol isomer (tentative) + unknown	NQ
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	∿180
0.75	TMS-$C_9H_{16}O_2$ acid isomer + TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿380

(continued)

TABLE C107. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.75	TMS-$C_{10}H_{18}O_2$ acid isomer	$\sim$320
0.76	TMS-branched $C_{10}H_{20}O_2$ acid isomer	$\sim$400
0.76	TMS-branched $C_{10}H_{20}O_2$ acid isomer	$\sim$140
0.77	TMS-branched $C_{10}H_{20}O_2$ acid isomer	$\sim$300
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer + unknown	$\sim$180
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	$\sim$3000
0.80	TMS-n-decanoic acid	3800
0.80	unknown	
0.81	TMS-branched $C_{11}H_{22}O_2$ acid isomer + unknown	$\sim$730
0.81	unknown	
0.83	TMS-$C_{10}H_{18}O_2$ acid isomer	$\sim$740
0.83	TMS-branched $C_{12}H_{24}O_2$ acid isomer	$\sim$340
0.84	unknown	
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	$\sim$200
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	$\sim$1400
0.87	TMS-n-undecanoic acid	$\sim$3000
0.87	unknown	
0.89	unknown	
0.90	TMS-$C_{12}H_{22}O_2$ acid isomer + unknown	$\sim$520
0.93	TMS-$C_{12}H_{22}O_2$ acid isomer	$\sim$380
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.94	TMS-$C_{12}H_{22}O_2$ acid isomer + unknown	$\sim$290
0.98	TMS-n-dodecanoic acid	160
1.00	D-10 ANTHRACENE	IS
1.04	TMS-n-tridecanoic acid	$\sim$420
1.17	TMS-$C_{16}H_{32}O_2$ acid isomer	$\sim$460
1.35	n-tetracosane	40
1.41	n-pentacosane	60
1.46	n-hexacosane	60

*Relative to the internal standard D-10 anthracene.

TABLE C108. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #17(78:43) B/N

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.45	TMS-phenol	1000
0.47	$C_7H_8O_2$ isomer (tentative)	NQ
0.47	TMS-$C_6H_{12}O_2$ acid isomer	~500
0.50	isophorone	420
0.52	TMS derivatization artifact	
0.52	TMS-o-cresol	690
0.53	TMS-m-cresol	~810
0.54	TMS-p-cresol	590
0.56	TMS-n-heptanoic acid	~1100
0.57	TMS-C_7H_9NO isomer (tentative)	NQ
0.58	TMS-C_7H_9NO isomer (tentative)	NQ
0.59	unknown	
0.60	TMS-dimethylphenol isomer	~54
0.61	TMS-C_2 alkylphenol isomer	~190
0.62	TMS-C_2 alkylphenol isomer	~170
0.63	TMS-C_2 alkylphenol isomer	~110
0.64	TMS-C_2 alkylphenol isomer	~110
0.64	TMS-n-octanoic acid	3800
0.65	unknown	
0.66	unknown	
0.67	unknown	
0.69	TMS-C_3 alkylphenol isomer	~300
0.69	unknown	
0.70	TMS-C_3 alkylphenol isomer	~180
0.71	TMS-C_3 alkylphenol isomer	~240
0.71	unknown	
0.72	TMS-n-nonanoic acid	3200
0.73	TMS-nitrophenol isomer	~1400
0.74	unknown	
0.75	TMS-nitrophenol isomer	~470
0.76	unknown	
0.78	unknown + carboxylic acid (tentative)	NQ
0.79	unknown	
0.79	TMS-n-decanoic acid	3300
0.81	unknown	
0.83	unknown	
0.86	unknown	
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.01	unknown	

*Relative to the internal standard D-10 anthracene.

TABLE C109. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #18(78:43) A

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	11000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~1800
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~660
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~820
0.44	TMS-phenol	210
0.45	TMS-$C_6H_{10}O_2$ acid isomer	~1000
0.47	TMS-n-hexanoic acid	13000
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-$C_7H_{14}O_2$ acid isomer	~880
0.51	TMS derivatization artifact	
0.52	TMS-C_7 acid isomer (tentative)	NQ
0.52	TMS-C_7 acid isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~2800
0.56	TMS-n-heptanoic acid	~14000
0.56	unknown	
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	~1500
0.58	TMS-$C_7H_{12}O_2$ acid isomer	~580
0.58	unknown	
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~660
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer	~700
0.60	TMS-C_8 acid isomer (tentative)	NQ
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	~680
0.63	TMS-acid, unknown	
0.64	TMS-n-octanoic acid	17000
0.65	TMS-$C_8H_{14}O_2$ acid isomer	~1200
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	~300
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~600
0.68	TMS-3-nitrophenol	~710
0.68	TMS-$C_9H_{16}O_2$ acid isomer	~140
0.69	unknown	
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	~930
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~3500
0.72	TMS-n-nonanoic acid	16000
0.73	TMS-$C_9H_{16}O_2$ acid isomer	~1200
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~470
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~190
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	~2700
0.80	TMS-n-decanoic acid	10000
0.81	unknown	
0.82	TMS- ~C_{10} acid derivative (tentative)	NQ
0.83	unknown	

(continued)

TABLE C109. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer + unknown	∿1000
0.86	TMS-n-undecanoic acid	∿2800
0.87	TMS-derivative, molecular weight 210 (tentative)	NQ
0.88	unknown	
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.94	TMS-C_{12} acid derivative (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.04	TMS-C_{13} acid derivative (tentative)	NQ
1.35	n-tetracosane	55
1.41	n-pentacosane	94
1.46	n-hexacosane	92
1.54	n-heptacosane	∿83

*Relative to the internal standard D-10 anthracene.

TABLE C110. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #18(78:43) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	unknown	
0.37	TMS derivatization artifact	
0.37	trimethylpyridine isomer	~690
0.38	trimethylpyridine isomer	~1700
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	1200
0.44	TMS derivatization artifact	
0.45	trimethylpyridine isomer	~10
0.46	$C_7H_8O_2$ isomer (tentative)	NQ
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	TMS-aminophenol isomer (tentative)	NQ
0.49	isophorone	780
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	640
0.52	TMS-m-cresol	~970
0.53	TMS-p-cresol	630
0.55	TMS-C_7H_9NO isomer (tentative)	NQ
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.59	TMS-C_2 alkylphenol isomer	~320
0.60	TMS-C_2 alkylphenol isomer	~280
0.61	TMS-C_2 alkylphenol isomer	~210
0.62	TMS-C_2 alkylphenol isomer	~120
0.63	unknown	
0.63	unknown mixture	
0.65	TMS-C_3 alkylphenol isomer	~780
0.67	TMS-nitrophenol isomer	~1200
0.69	unknown	
0.70	TMS-C_3 alkylphenol isomer	~280
0.70	unknown	
0.71	TMS-n-nonanoic acid	1100
0.72	TMS-nitrophenol isomer	~1300
0.75	TMS-nitrophenol isomer	~540
0.79	TMS-n-decanoic acid	2000
0.84	unknown	
0.87	TMS-n-undecanoic acid	~1300
0.93	unknown	
1.00	D-10 ANTHRACENE	IS
1.30	n-tricosane	39
1.35	n-tetracosane	82
1.40	n-pentacosane	94
1.46	n-hexacosane	100
1.54	n-heptacosane	~96
1.62	n-octacosane	~61
1.74	n-nonacosane	~72

*Relative to the internal standard D-10 anthracene.

TABLE C111. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #19(80:15) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	7000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~180
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~920
0.42	TMS-branched $C_6H_{12}O_2$ acid isomer	~400
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~710
0.44	TMS-phenol	290
0.45	TMS-$C_6H_{10}O_2$ acid isomer	~680
0.46	TMS-n-hexanoic acid	8800
0.47	TMS-aminophenol isomer (tentative) +	NQ
	TMS-$C_6H_{10}O_2$ acid isomer	~810
0.48	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-branched $C_7H_{14}O_2$ acid isomer	~570
0.50	TMS derivatization artifact	
0.52	TMS-$C_7H_{12}O_2$ acid isomer	~1000
0.52	TMS-nitrosophenol isomer (tentative) +	NQ
	TMS-$C_7H_{14}O_2$ acid isomer	~1200
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~1800
0.56	TMS-n-heptanoic acid	~11000
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	~1400
0.57	TMS-$C_7H_{12}O_2$ acid isomer	~360
0.58	TMS-branched $C_9H_{18}O_2$ acid isomer	~71
0.59	TMS-$C_8H_{14}O_2$ acid isomer	~430
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer	~600
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~960
0.61	TMS-C_2 alkylphenol (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	~840
0.62	TMS-$C_8H_{14}O_2$ acid isomer	~3700
0.64	TMS-n-octanoic acid	15000
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	~890
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~1200
0.67	TMS-3-nitrophenol	~120
0.69	TMS-$C_{10}H_{18}O_2$ acid isomer + unknown	~1400
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	~710
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~3100
0.72	TMS-n-nonanoic acid	17000
0.73	TMS-$C_9H_{16}O_2$ acid isomer	~1100
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~390
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	~210
0.75	TMS-$C_{10}H_{18}O_2$ acid isomer	~390
0.75	TMS-branched $C_{10}H_{20}O_2$	~250
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	~2900
0.80	TMS-n-decanoic acid	10000

(continued)

TABLE C111. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.80	unknown	
0.81	unknown	
0.83	TMS-branched $C_{11}H_{22}O_2$ acid isomer	∿540
0.83	unknown	
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	∿1200
0.86	TMS-n-undecanoic acid	∿3000
0.87	TMS-derivative, molecular weight 210 (tentative) +	NQ
	TMS- ∿C_{11} acid derivative (tentative)	NQ
0.89	unknown	
0.93	TMS-$C_{15}H_{28}O$ isomer	NQ
1.00	D-10 ANTHRACENE	IS
1.04	TMS- ∿C_{13} acid derivative (tentative)	NQ
1.35	n-tetracosane	63
1.40	n-pentacosane	100
1.46	n-hexacosane	89
1.53	n-heptacosane	∿81

*Relative to the internal standard D-10 anthracene.

TABLE C112. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #19(80:15) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	~1300
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	560
0.44	TMS derivatization artifact	
0.45	trimethylpyridine isomer	~23
0.47	TMS-aminophenol isomer (tentative)	NQ
0.49	isophorone	280
0.49	n-undecane	26
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	270
0.52	TMS-m-cresol	~520
0.53	TMS-p-cresol	350
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.57	TMS-C_7H_9NO isomer (tentative)	NQ
0.59	TMS-dimethylphenol isomer	~120
0.60	TMS-C_2 alkylphenol isomer	~170
0.61	TMS-C_2 alkylphenol isomer	~90
0.62	TMS-C_2 alkylphenol isomer	~34
0.63	unknown	
0.63	unknown mixture	
0.65	unknown + TMS-C_3 alkylphenol isomer	~460
0.65	unknown	
0.67	TMS-nitrophenol isomer	~330
0.68	TMS-C_3 alkylphenol isomer	~230
0.69	unknown	
0.71	TMS-n-nonanoic acid	440
0.72	TMS-nitrophenol isomer	~950
0.73	unknown	
0.75	TMS-nitrophenol isomer	~290
0.79	TMS-n-decanoic acid	830
0.83	n-pentadecane	180
0.84	unknown	
0.87	TMS-n-undecanoic acid	~720
0.97	n-heptadecane	110
0.97	C_{18} branched alkane	~40
0.99	C_{18} alkene	~14
0.99	TMS-$C_{13}H_{26}O_2$ acid isomer	~21
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	~7
1.03	n-octadecane	41
1.04	C_{19} branched alkane	~27
1.09	n-nonadecane	41
1.14	n-eicosane	65
1.20	n-heneicosane	51

(continued)

TABLE C112. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.26	n-docosane	42
1.30	n-tricosane	47
1.35	n-tetracosane	59
1.40	n-pentacosane	96
1.46	n-hexacosane	110
1.54	n-heptacosane	∿97
1.62	n-octacosane	∿78
1.74	n-nonacosane	∿85
1.88	n-triacontane	∿48

*Relative to the internal standard D-10 anthracene.

TABLE C113. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #20(82:45) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	770
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	~510
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	~15
0.43	TMS-phenol	390
0.47	TMS-n-hexanoic acid	4000
0.47	unknown	
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-branched $C_7H_{14}O_2$ acid isomer	~590
0.51	TMS derivatization artifact	
0.51	TMS-o-cresol	18
0.52	TMS-branched $C_7H_{14}O_2$ acid isomer	~770
0.52	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	~980
0.56	TMS-n-heptanoic acid	~12000
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	~1700
0.57	TMS-$C_7H_{12}O_2$ acid isomer	~140
0.58	TMS-C_7H_9NO isomer (tentative)	NQ
0.59	TMS-C_7H_9NO isomer (tentative)	NQ
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~500
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer	~910
0.60	TMS-$C_8H_{14}O_2$ acid isomer	~350
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	~480
0.63	unknown	
0.64	TMS-n-octanoic acid	15000
0.65	unknown	
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	~350
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	~890
0.68	TMS-3-nitrophenol	~860
0.68	TMS-$C_9H_{16}O_2$ acid isomer	~63
0.69	TMS-$C_{10}H_{18}O_2$ acid isomer	~2200
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	~470
0.71	TMS-$C_9H_{16}O_2$ acid isomer	~2700
0.72	TMS-n-nonanoic acid	16000
0.73	unknown	
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~500
0.74	unknown	
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	~200
0.75	TMS-$C_{10}H_{18}O_2$ acid isomer	~690
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~360
0.76	TMS-$C_{10}H_{18}O_2$ acid isomer	~120
0.76	TMS-branched $C_{10}H_{20}O_2$ acid isomer	~190

(continued)

TABLE C113. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	~2300
0.80	TMS-n-decanoic acid	11000
0.81	unknown	
0.83	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~530
0.84	unknown	
0.85	TMS-$C_{11}H_{20}O_2$ acid isomer	~160
0.86	TMS- ~C_{11} acid derivative (tentative)	NQ
0.92	TMS-n-undecanoic acid	~3000
0.87	unknown	
0.89	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.92	TMS-$C_{12}H_{22}O_2$ acid isomer	~91
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.04	TMS-$C_{13}H_{26}O_2$ acid isomer	~140
1.35	n-tetracosane	52
1.41	n-pentacosane	84
1.46	n-hexacosane	75
1.54	n-heptacosane	~71

*Relative to the internal standard D-10 anthracene.

TABLE C114. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #20(82:45) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	trimethylpyridine isomer	∿820
0.38	trimethylpyridine isomer	∿750
0.39	trimethylpyridine isomer	∿250
0.40	unknown + n-decane	∿160
0.41	$C_7H_{10}O$ ketone (tentative) + unknown	NQ
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	610
0.44	$C_9H_{13}N$ isomer (tentative) + TMS derivatization artifact	NQ
0.45	TMS derivatization artifact	
0.46	trimethylpyridine isomer	∿8
0.46	$C_9H_{13}N$ isomer (tentative)	NQ
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	unknown + undecene	∿230
0.49	isophorone	460
0.49	n-undecane	210
0.50	TMS-thiophenol isomer (tentative)	NQ
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	540
0.52	TMS-m-cresol	∿500
0.53	TMS-p-cresol	450
0.55	TMS-C_7H_9NO isomer (tentative)	NQ
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.57	TMS-C_7H_9NO isomer (tentative)	NQ
0.58	n-dodecane	170
0.59	TMS-C_2 alkylphenol isomer	∿70
0.60	TMS-C_2 alkylphenol isomer	∿350
0.61	TMS-C_2 alkylphenol isomer	∿130
0.62	TMS-C_2 alkylphenol isomer	∿270
0.63	unknown	
0.65	TMS-C_3 alkylphenol isomer	∿280
0.67	unknown + n-tridecane	350
0.67	TMS-nitrophenol isomer	∿780
0.68	TMS-C_3 alkylphenol isomer	∿190
0.69	unknown	
0.71	TMS-n-nonanoic acid	740
0.72	TMS-nitrophenol isomer	∿1200
0.73	unknown	
0.75	unknown + n-tetradecane	∿650
0.78	unknown	
0.79	TMS-n-decanoic acid	1300
0.82	n-pentadecane	150
0.84	unknown	
0.86	TMS-n-undecanoic acid	∿1100

(continued)

TABLE C114. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.89	hexadecene	∿42
0.93	unknown	
0.96	heptadecene	∿30
0.96	n-heptadecane	180
0.97	C_{18} branched alkane	∿98
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.02	octadecene	∿38
1.03	n-octadecane	100
1.04	C_{19} branched alkane	∿79
1.06	C_{19} alkene	∿35
1.08	nonadecene	∿26
1.09	n-nonadecane	120
1.14	eicosene	∿46
1.14	n-eicosane	150
1.19	C_{21} branched alkane	∿16
1.19	heneicosene	∿17
1.20	n-heneicosane	130
1.23	C_{22} branched alkane	∿12
1.25	docosene	∿26
1.25	n-docosane	96
1.30	tricosene	∿22
1.30	n-tricosane	110
1.35	tetracosene	∿10
1.35	n-tetracosane	93
1.40	pentacosene	∿14
1.40	n-pentacosane	150
1.46	hexacosene	∿16
1.46	n-hexacosane	140
1.53	heptacosene	∿10
1.53	n-heptacosane	∿180
1.62	n-octacosane	∿160
1.73	n-nonacosane	∿180
1.87	n-triacontane	∿88
2.04	n-hentriacontane	∿96
2.27	n-dotriacontane	∿29

*Relative to the internal standard D-10 anthracene.

TABLE C115. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #21(85:46) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	5900
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿1900
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿550
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿1100
0.43	TMS-phenol	170
0.45	TMS-$C_6H_{10}O_2$ acid isomer	∿1000
0.47	TMS-n-hexanoic acid	5100
0.47	unknown	
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-branched $C_7H_{14}O_2$ acid isomer	∿1300
0.48	TMS derivatization artifact	
0.52	TMS-$C_7H_{12}O_2$ acid isomer	∿1600
0.52	TMS-nitrosophenol isomer (tentative)	NQ
0.54	TMS-$C_7H_{12}O_2$ acid isomer	∿970
0.56	TMS-n-heptanoic acid	∿16000
0.56	TMS-C_7H_9NO isomer (tentative)	NQ
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	∿500
0.57	TMS-$C_7H_{12}O_2$ acid isomer	∿740
0.58	TMS-methylnitrosophenol isomer (tentative)	NQ
0.59	TMS-nitrosophenol isomer (tentative)	NQ
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿630
0.60	TMS-branched $C_8H_{16}O_2$ acid isomer	∿810
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿680
0.61	TMS-C_2 alkylphenol isomer (tentative)	NQ
0.62	TMS-branched $C_9H_{18}O_2$ acid isomer	∿400
0.63	unknown	
0.64	TMS-n-octanoic acid	15000
0.65	TMS-$C_8H_{14}O_2$ acid isomer	∿710
0.65	TMS-branched $C_9H_{18}O_2$ acid isomer	∿900
0.67	TMS-branched $C_9H_{18}O_2$ acid isomer	∿510
0.68	TMS-3-nitrophenol	∿910
0.68	TMS-$C_9H_{16}O_2$ acid isomer	∿160
0.69	TMS-$C_{10}H_{18}O_2$ acid isomer	∿1700
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	∿840
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿3200
0.72	TMS-n-nonanoic acid	16000
0.73	unknown	
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	∿150
0.75	TMS-$C_{10}H_{18}O_2$ acid isomer	∿400
0.78	unknown	
0.78	TMS-$C_{10}H_{18}O_2$ acid isomer	∿2500
0.80	TMS-n-decanoic acid	8300
0.80	TMS-$C_{10}H_{18}O_2$ acid isomer	∿460

(continued)

TABLE C115. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	unknown	
0.82	TMS- ∿C_{11} acid isomer (tentative)	NQ
0.83	unknown	
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	∿970
0.86	TMS-n-undecanoic acid	∿2600
0.87	unknown	
0.88	unknown	
0.92	TMS-$C_{12}H_{22}O_2$ acid isomer	∿160
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.04	TMS-branched $C_{13}H_{26}O_2$ acid isomer	∿600
1.35	n-tetracosane	65
1.41	n-pentacosane	90
1.46	n-hexacosane	85
1.54	n-heptacosane	∿77

*Relative to the internal standard D-10 anthracene.

TABLE C116. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #21(85:46) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	unknown + trimethylpyridine isomer	~700
0.40	n-decane	120
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.43	TMS-phenol	360
0.44	TMS derivatization artifact	
0.45	trimethylpyridine isomer	~13
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS derivatization artifact + TMS-aminophenol isomer (tentative)	NQ
0.48	undecene	~130
0.49	isophorone	240
0.49	n-undecane	97
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	220
0.52	TMS-m-cresol	~330
0.53	TMS-p-cresol	200
0.58	n-dodecane	110
0.59	TMS-dimethylphenol isomer	~21
0.60	TMS-dimethylphenol isomer	~120
0.61	TMS-dimethylphenol isomer	~35
0.62	TMS-C_2 alkylphenol isomer	28
0.63	unknown	
0.63	unknown mixture	
0.66	tridecene	~49
0.67	TMS-nitrophenol isomer	~190
0.69	unknown	
0.72	TMS-n-nonanoic acid	450
0.72	TMS-nitrophenol isomer	~740
0.75	TMS-nitrophenol isomer	~350
0.75	unknown	
0.80	TMS-n-decanoic acid	820
0.80	C_{15} branched alkane	~140
0.83	n-pentadecane	200
0.86	TMS-n-undecanoic acid	~690
0.89	hexadecene	~20
0.90	n-hexadecane	150
0.93	unknown	
0.93	C_{17} branched alkane	~490
0.96	heptadecene	~59
0.97	n-heptadecane	160
0.97	C_{18} branched alkane	~81
0.98	~C_{18} alkene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

(continued)

TABLE C116. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.02	octadecene	∿35
1.03	n-octadecane	65
1.04	C_{19} branched alkane	∿48
1.07	∿ C_{19} alkene (tentative)	NQ
1.08	nonadecene	∿23
1.09	n-nonadecane	88
1.14	eicosene	∿35
1.15	n-eicosane	110
1.19	C_{21} branched alkane	∿14
1.20	heneicosene	∿13
1.20	n-heneicosane	95
1.23	∿ C_{22} alkene (tentative)	NQ
1.25	docosene	∿18
1.25	n-docosane	87
1.29	C_{23} branched alkane	∿19
1.30	tricosene	∿12
1.31	n-tricosane	94
1.35	tetracosene	∿10
1.35	n-tetracosane	79
1.40	pentacosene	∿7
1.41	n-pentacosane	130
1.46	hexacosene	∿12
1.46	n-hexacosane	110
1.53	n-heptacosane	∿120
1.62	n-octacosane	∿110
1.71	unknown	
1.73	n-nonacosane	∿150
1.87	n-triacontane	∿75
2.05	n-hentriacontane	∿92

*Relative to the internal standard D-10 anthracene.

TABLE C117. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #22(88:75) A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	TMS-n-pentanoic acid	11000
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿2700
0.40	TMS-branched $C_6H_{12}O_2$ acid isomer	∿96
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿680
0.43	TMS-branched $C_6H_{12}O_2$ acid isomer	∿740
0.43	TMS-phenol	150
0.45	TMS-$C_6H_{10}O_2$ acid isomer	∿170
0.47	TMS-n-hexanoic acid	15000
0.48	TMS-aminophenol isomer (tentative)	NQ
0.48	TMS-aminophenol isomer (tentative)	NQ
0.49	TMS-branched $C_7H_{14}O_2$ acid isomer	∿980
0.51	TMS derivatization artifact	
0.52	TMS- ∿C_7 acid derivative (tentative)	NQ
0.53	TMS-nitrosophenol isomer (tentative)	NQ
0.55	TMS-$C_7H_{12}O_2$ acid isomer	∿630
0.56	TMS-n-heptanoic acid	>20000
0.57	TMS-branched $C_8H_{16}O_2$ acid isomer	∿1600
0.58	TMS-$C_7H_{12}O_2$ acid isomer	∿990
0.58	TMS-methylnitrosophenol isomer (tentative)	NQ
0.59	TMS-methylnitrosophenol isomer (tentative)	NQ
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿320
0.60	TMS-$C_8H_{14}O_2$ acid isomer	∿570
0.61	TMS-C_2 alkylphenol isomer (tentative)	NQ
0.63	unknown	
0.64	TMS-n-octanoic acid	>20000
0.65	TMS-p-chloro-m-cresol	770
0.66	TMS-branched $C_9H_{18}O_2$ acid isomer	∿350
0.66	TMS-$C_8H_{14}O_2$ acid isomer	∿190
0.67	TMS-$C_9H_{18}O_2$ acid isomer	∿1800
0.68	TMS-3-nitrophenol	∿1500
0.68	TMS-p-toluic acid	2700
0.69	TMS-$C_{10}H_{18}O_2$ acid isomer	∿2300
0.70	TMS-$C_{10}H_{18}O_2$ acid isomer	∿2000
0.71	TMS-$C_9H_{16}O_2$ acid isomer	∿2800
0.72	TMS-n-nonanoic acid	18000
0.73	TMS-$C_9H_{16}O_2$ acid isomer	∿510
0.73	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿290
0.74	TMS-$C_{10}H_{18}O_2$ acid isomer	∿220
0.75	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿330
0.75	unknown	
0.76	TMS-branched $C_{10}H_{20}O_2$ acid isomer	∿470
0.76	TMS-$C_{10}H_{18}O_2$ acid isomer	∿230
0.77	unknown	

(continued)

TABLE C117. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.78	unknown	
0.79	TMS-$C_{10}H_{18}O_2$ acid isomer	~3500
0.80	TMS-n-decanoic acid	9800
0.81	unknown	
0.81	unknown	
0.83	TMS-branched $C_{11}H_{22}O_2$ acid isomer	~900
0.83	TMS-branched $C_{12}H_{24}O_2$ acid isomer	~490
0.84	unknown	
0.84	TMS-~C_{12} acid derivative (tentative)	NQ
0.85	unknown	
0.86	TMS-$C_{11}H_{20}O_2$ acid isomer	~170
0.86	TMS-n-undecanoic acid	~3600
0.87	unknown	
0.89	unknown	
0.90	unknown	
0.92	unknown	
0.93	TMS-$C_{12}H_{22}O_2$ acid isomer	~350
0.93	TMS-$C_{15}H_{28}O$ isomer (tentative)	NQ
0.94	unknown	
0.98	TMS-branched $C_{12}H_{24}O$ acid isomer	~320
1.00	D-10 ANTHRACENE	IS
1.04	TMS-$C_{12}H_{22}O_2$ acid isomer	~340
1.05	TMS-n-tridecanoic acid	~1200
1.17	TMS-n-hexadecanoic acid	~300
1.35	n-tetracosane	63
1.41	n-pentacosane	93
1.46	n-hexacosane	87
1.54	n-heptacosane	~89

*Relative to the internal standard D-10 anthracene.

TABLE C118. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #22(88:75) B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethylpyridine isomer	~1200
0.40	n-decane	140
0.41	$C_7H_{10}O$ ketone (tentative)	NQ
0.44	TMS-phenol	470
0.44	TMS derivatization artifact	
0.47	TMS-aminophenol isomer (tentative)	NQ
0.48	undecene	~110
0.49	n-undecane	93
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	220
0.52	TMS-m-cresol	~460
0.53	TMS-p-cresol	280
0.56	C_7H_9NO isomer (tentative)	NQ
0.58	n-dodecane	99
0.59	TMS-C_2 alkylphenol isomer	~280
0.60	TMS-C_2 alkylphenol isomer	~110
0.61	TMS-C_2 alkylphenol isomer	~81
0.64	unknown + TMS-C_3 alkylphenol isomer	~290
0.67	TMS-nitrophenol isomer	~230
0.68	TMS-C_3 alkylphenol isomer	~250
0.69	unknown	
0.70	TMS-C_3 alkylphenol isomer	~120
0.71	TMS-n-nonanoic acid	550
0.72	TMS-nitrophenol isomer	~850
0.73	unknown	
0.75	TMS-nitrophenol isomer	~530
0.75	unknown + n-tetradecane	~200
0.79	TMS-n-decanoic acid	1100
0.82	n-pentadecane	210
0.84	unknown	
0.86	TMS-n-undecanoic acid	~870
0.90	n-hexadecane	120
0.93	unknown	
0.93	unknown	
0.96	n-heptadecane	230
0.97	C_{18} branched alkane	~94
0.98	~C_{18} alkene (tentative)	NQ
0.99	TMS-$C_{13}H_{26}O_2$ acid isomer	~31
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	~25
1.03	n-octadecane	76
1.04	C_{19} branched alkane	~92

(continued)

TABLE C118. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.08	nonadecene	~19
1.09	n-nonadecane	110
1.14	eicosene	~37
1.15	n-eicosane	100
1.20	heneicosene	~16
1.20	n-heneicosane	93
1.25	docosene	~27
1.25	n-docosane	82
1.30	tricosene	~14
1.30	n-tricosane	87
1.35	tetracosene	~4
1.35	n-tetracosane	94
1.40	n-pentacosane	150
1.46	n-hexacosane	140
1.53	n-heptacosane	~160
1.62	n-octacosane	~130
1.73	n-nonacosane	~160
1.87	n-triacontane	~72
2.04	n-hentriacontane	~390

*Relative to the internal standard D-10 anthracene.

APPENDIX D
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES FROM COAL-FIRED POWER PLANTS - SAMPLE LIST

Organization	Site	Sample description	Sample code
E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021701
E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021702
E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021703
E.H. Richardson/EGD	Beesley Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021712
E.H. Richardson/EGD	Beesely Point, NJ	Water sample from Atlantic City Electric Company, B.L. England Station	021713
E.H. Richardson/EGD	Vero Beach, FL	Water sample from Vero Beach Municipal Power Station	021705
E.H. Richardson/EGD	Vero Beach, FL	Water sample from Vero Beach Municipal Power Station	021706
E.H. Richardson/EGD	Vero Beach, FL	Water sample from Vero Beach Municipal Power Station	021708
E.H. Richardson/EGD	Newark, NJ	Water sample from Public Service Electric and Gas Company, Linden Generating Station	021711
E.H. Richardson/EGD	Marion, IL	Water sample from Southern Illinois Power Corporation, Marion Generating Station	021714
E.H. Richardson/EGD	Marion, IL	Water sample from Southern Illinois Power Corporation, Marion Generating Station	021715
E.H. Richardson/EGD	Marion, IL	Water sample from Southern Illinois Power Corporation, Marion Generating Station	021718
E.H. Richardson/EGD	Jacksonville, IL	Water sample from Western Illinois Power Corporation, Pearl Generating Station	021720
E.H. Richardson/EGD	Jacksonville, IL	Water sample from Western Illinois Power Corporation, Pearl Generating Station	021723
E.H. Richardson/EGD	Chicago, IL	Water sample from Commonwealth Edison, Crawford Generating Station	021725

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
E.H. Richardson/EGD	Fergus Falls, MN	Water sample from Otter Tail Power Company, Hoot Lake Power Station	021726
E.H. Richardson/EGD	Fergus Falls, MN	Water sample from Otter Tail Power Company, Hoot Lake Power Station	021727
E.H. Richardson/EGD	Rapid City, SD	Water sample from Black Hills Power and Light, Ben French Station	021731
E.H. Richardson/EGD	Canton, OH	Water sample from Ohio Power Company, Kammer Station	021732
E.H. Richardson/EGD	Canton, OH	Water sample from Ohio Power Company, Kammer Station	021733
E.H. Richardson/EGD	Canton, OH	Water sample from Ohio Power Company, Kammer Station	021734
E.H. Richardson/EGD	Canton, OH	Water sample from Ohio Power Company, Kammer Station	021735
E.H. Richardson/EGD	Akron, OH	Water sample from Ohio Edison, R.E. Burger	021736
E.H. Richardson/EGD	Akron, OH	Water sample from Ohio Edison, Gorge Plant	021739
E.H. Richardson/EGD	Pensacola, FL	Water sample from Florida Power and Light Crist Station	021744
E.H. Richardson/EGD	Pensacola, FL	Water sample from Florida Power and Light Crist Station	021755
E.H. Richardson/EGD	Shippingport, PA	Water sample from Pennsylvania Power Company Bruce Mansfield	021745
E.H. Richardson/EGD	Houston, TX	Water sample from Houston Lighting and Bertran Station	021747
E.H. Richardson/EGD	Houston, TX	Water sample from Houston Lighting and Bertran Station	021748
E.H. Richardson/EGD	Bismark, ND	Water sample from Montana-Dakota Utilities Company, Lewis and Clark Station	021749
Rockwell International	Stanton, ND	Fly ash sample from Leland Olds Power Station	Leland Olds
Rockwell International	Center, ND	Fly ash sample from Milton R. Young Power Station	Milton R. Young
Rockwell International	Big Stone City, SD	Fly ash sample from Big Stone Station	Big Stone
Rockwell International	Fergus Falls, MN	Fly ash sample from Hoot Lake Station	Hoot Lake

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
Rockwell International	Stanton, ND	Fly ash sample from U.P.A. Station	U.P.A.
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	0120-1
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	10-3
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	8-2
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	1209-1
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	0124-1
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	17-1
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	0116-1
Rockwell International	Stanton, ND	Scrubber "Sludge" sample from Leland Olds Power Station	1005-1
Rockwell International	Stanton, ND	Water sample from Leland Olds Power Station	Pond Water

TABLE D1. MERCURY ANALYSIS OF EFFLUENTS FROM COAL-FIRED POWER PLANTS

Sample Number/Power Plant Location	Concentration (ppb Hg)
021702 MT (B.L. England Station, Atlantic City Electric Station)	0.6
021703 MD	0.6
021703 BLK	<0.2
021703 MT	0.2
021713 MT	<0.2
021705 MT (Vero Beach Municipal Power Station)	2.8
021708 MT	2.5
021714 MT (Marion Station, Southern Illinois Power Coop.)	0.8
021714 MD	1.7
021715 MD	1.5
021715 MT	<0.2
021720 MT (Pearl Station, Western Illinois Power Coop.)	<0.2
021720 MD	1.0
021726 MD (Hoot Lake Power Station, Otter Tail Power Company)	<0.2
021726 MT	0.2
021731 MT (Ben French Station, Black Hills Power and Light)	<0.2
021733 MT (Kammer Station, Ohio Power Company)	<0.2
021733 MD	1.3
021736 MD (R.E. Burger Station, Ohio Edison Company)	4.0
021736 MT	<0.2
021739 MT (George Plant, Ohio Edison Company)	<0.2
021739 MD	0.7

(continued)

TABLE D1. (continued)

Sample Number/Power Plant Location		Concentration (ppb Hg)
021744 MD	(Crist Station, Florida Power and Light)	3.4
021744 MT		<0.2
021755 MT		<0.2
021745 MT	(Bruce Mansfield Station, Pennsylvania Power Company)	<0.2
021749 MT	(Louis and Clark Station, Montana-Dakota Utilities Company)	<0.2
021749 MD		1.2

TABLE D2. MERURY ANALYSIS OF FLY ASH AND
SCRUBBER "SLUDGE" FROM COAL-FIRED POWER PLANTS

Sample Number	Concentration (ppb Hg)
Leland Olds	<0.1
Milton Young	<0.1
Big Stone	0.4
Hoot Lake	<0.1
UPA	<0.1
0120-1	<0.1
10-3	0.4
8-2	0.3
1209-1	0.2
0124-1	0.2
17-1	0.2
0116-1	1.0
1005-1	0.6

TABLE D3. SSMS DATA FOR SAMPLE 021702 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.06	Fluorine	≈0.2	Neodymium	<0.002	Strontium	2
Antimony	0.3	Gadolinium	<0.002	Nickel	INT	Sulfur	MC
Arsenic	0.04	Gallium	<0.002	Niobium	≤0.009	Tantalum	<0.002
Barium	0.06	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.03	Thallium	<0.002
Boron	0.2	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	1	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.005	Iodine	0.008	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.1
Cerium	0.004	Iron	0.3	Rhodium	<0.002	Tungsten	<0.002
Cesium	0.006	Lanthanum	0.004	Rubidium	0.04	Uranium	<0.002
Chlorine	MC	Lead	0.007	Ruthenium	<0.002	Vanadium	≤0.003
Chromium	0.005	Lithium	0.05	Samarium	<0.002	Ytterbium	<0.002
Cobalt	≤0.003	Lutetium	<0.002	Scandium	≤0.001	Yttrium	<0.002
Copper	0.01	Magnesium	MC	Selenium	≤0.2	Zinc	0.05
Dysprosium	<0.002	Manganese	0.2	Silicon	0.6	Zirconium	0.01
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.02	Sodium	>4		

NR - Not Reported

MC - Major Component

INT - Interference

TABLE D4. SSMS DATA FOR SAMPLE 021703 MD.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≈3	Neodymium	<0.002	Strontium	3
Antimony	0.02	Gadolinium	<0.002	Nickel	INT	Sulfur	MC
Arsenic	0.09	Gallium	<0.002	Niobium	≤0.005	Tantalum	<0.002
Barium	0.06	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.07	Thallium	<0.002
Boron	0.2	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	2	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	≤0.01	Iodine	0.01	Praseodymium	<0.002	Tin	0.005
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.3
Cerium	0.003	Iron	0.2	Rhodium	<0.002	Tungsten	<0.002
Cesium	0.006	Lanthanum	≤0.006	Rubidium	0.04	Uranium	0.02
Chlorine	MC	Lead	0.02	Ruthenium	<0.002	Vanadium	0.04
Chromium	0.006	Lithium	0.02	Samarium	<0.002	Ytterbium	<0.002
Cobalt	≤0.003	Lutetium	<0.002	Scandium	≤0.002	Yttrium	<0.002
Copper	0.03	Magnesium	MC	Selenium	0.008	Zinc	0.3
Dysprosium	<0.002	Manganese	0.02	Silicon	0.7	Zirconium	0.01
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.06	Sodium	>5		

NR - Not reported

INT - Interference

MC - Major component

TABLE D5. SSMS DATA FOR SAMPLE 021703 MT.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈0.9	Neodymium	< 0.001	Strontium	3
Antimony	0.02	Gadolinium	< 0.001	Nickel	INT	Sulfur	>6
Arsenic	0.05	Gallium	< 0.001	Niobium	0.003	Tantalum	< 0.001
Barium	0.2	Germanium	< 0.001	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.2	Thallium	< 0.001
Boron	0.2	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	2	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	0.006	Iodine	0.006	Praseodymium	< 0.001	Tin	0.004
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.02
Cerium	0.003	Iron	0.6	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	0.006	Lanthanum	0.007	Rubidium	0.07	Uranium	0.02
Chlorine	MC	Lead	0.02	Ruthenium	< 0.001	Vanadium	0.003
Chromium	0.009	Lithium	0.02	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	≤0.001	Lutetium	< 0.001	Scandium	≤0.001	Yttrium	0.003
Copper	0.05	Magnesium	MC	Selenium	0.006	Zinc	0.3
Dysprosium	< 0.001	Manganese	0.03	Silicon	0.7	Zirconium	0.005
Erbium	< 0.001	Mercury	NR	Silver	0.01		
Europium	< 0.001	Molybdenum	0.05	Sodium	>2		

NR - Not reported

INT - Interference

MC - Major component

TABLE D6. SSMS DATA FOR SAMPLE 021703 DI (Blank)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	≥1	Fluorine	≈0.1	Neodymium	< 0.002	Strontium	0.2
Antimony	< 0.002	Gadolinium	< 0.002	Nickel	0.02	Sulfur	0.1
Arsenic	0.003	Gallium	< 0.002	Niobium	< 0.002	Tantalum	< 0.002
Barium	0.4	Germanium	< 0.002	Osmium	< 0.002	Tellurium	< 0.002
Beryllium	< 0.002	Gold	< 0.002	Palladium	< 0.002	Terbium	< 0.002
Bismuth	< 0.002	Hafnium	< 0.002	Phosphorus	0.2	Thallium	< 0.002
Boron	0.001	Holmium	< 0.002	Platinum	< 0.002	Thorium	< 0.002
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	< 0.002
Cadmium	< 0.002	Iodine	0.002	Praseodymium	< 0.002	Tin	< 0.002
Calcium	MC	Iridium	< 0.002	Rhenium	< 0.002	Titanium	0.04
Cerium	0.002	Iron	0.4	Rhodium	< 0.002	Tungsten	< 0.002
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.03	Uranium	0.03
Chlorine	0.7	Lead	0.01	Ruthenium	< 0.002	Vanadium	0.004
Chromium	0.01	Lithium	0.08	Samarium	< 0.002	Ytterbium	< 0.002
Cobalt	≤0.002	Lutetium	< 0.002	Scandium	≤0.002	Yttrium	< 0.002
Copper	0.08	Magnesium	4	Selenium	< 0.002	Zinc	0.4
Dysprosium	< 0.002	Manganese	0.02	Silicon	0.1	Zirconium	0.008
Erbium	< 0.002	Mercury	NR	Silver	< 0.002		
Europium	< 0.002	Molybdenum	0.03	Sodium	>4		

NR - Not reported

MC - Major component

TABLE D7. SSMS DATA FOR SAMPLE 021713

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈6	Neodymium	<0.004	Strontium	7
Antimony	0.08	Gadolinium	<0.004	Nickel	INT	Sulfur	MC
Arsenic	0.2	Gallium	<0.004	Niobium	<0.004	Tantalum	<0.004
Barium	0.1	Germanium	<0.004	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.3	Thallium	<0.004
Boron	0.9	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	4	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	<0.004	Iodine	0.02	Praseodymium	<0.004	Tin	0.02
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.1
Cerium	0.006	Iron	1	Rhodium	<0.004	Tungsten	<0.004
Cesium	0.03	Lanthanum	0.01	Rubidium	0.2	Uranium	0.03
Chlorine	MC	Lead	≤0.02	Ruthenium	<0.004	Vanadium	0.008
Chromium	0.02	Lithium	0.1	Samarium	<0.004	Ytterbium	<0.004
Cobalt	≤0.007	Lutetium	<0.004	Scandium	≤0.003	Yttrium	<0.004
Copper	0.04	Magnesium	MC	Selenium	0.03	Zinc	0.1
Dysprosium	<0.004	Manganese	0.09	Silicon	4	Zirconium	0.007
Erbium	<0.004	Mercury	NR	Silver	<0.004		
Europium	<0.004	Molybdenum	0.05	Sodium	MC		

NR - Not Reported

MC - Major Component

INT - Interference

TABLE D8. SSMS DATA FOR SAMPLE 021705 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈0.8	Neodymium	<0.002	Strontium	3
Antimony	0.4	Gadolinium	<0.002	Nickel	0.02	Sulfur	MC
Arsenic	0.02	Gallium	0.003	Niobium	0.009	Tantalum	<0.002
Barium	0.5	Germanium	0.005	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	9	Thallium	0.6
Boron	0.4	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.8	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.04	Iodine	0.08	Praseodymium	<0.002	Tin	0.007
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.06
Cerium	0.003	Iron	0.5	Rhodium	<0.002	Tungsten	<0.002
Cesium	0.08	Lanthanum	0.005	Rubidium	0.02	Uranium	0.05
Chlorine	3	Lead	0.02	Ruthenium	<0.002	Vanadium	0.01
Chromium	0.006	Lithium	0.7	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.002	Lutetium	<0.002	Scandium	≤0.001	Yttrium	0.002
Copper	0.2	Magnesium	MC	Selenium	≤0.6	Zinc	0.2
Dysprosium	<0.002	Manganese	0.02	Silicon	5	Zirconium	0.006
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.1	Sodium	>6		

NR - Not Reported

MC - Major Component

TABLE D9. SSMS DATA FOR SAMPLE 021708 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.7	Fluorine	≈1	Neodymium	<0.002	Strontium	2
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.01	Sulfur	>9
Arsenic	0.02	Gallium	0.001	Niobium	0.003	Tantalum	<0.002
Barium	0.1	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	MC	Thallium	<0.002
Boron	0.1	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.5	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.005	Iodine	0.07	Praseodymium	<0.002	Tin	0.003
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.04
Cerium	0.002	Iron	0.1	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	<0.002	Rubidium	0.03	Uranium	0.03
Chlorine	0.8	Lead	0.03	Ruthenium	<0.002	Vanadium	0.005
Chromium	≤0.003	Lithium	0.04	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.001	Lutetium	<0.002	Scandium	≤0.001	Yttrium	<0.002
Copper	0.04	Magnesium	MC	Selenium	0.002	Zinc	0.1
Dysprosium	<0.002	Manganese	0.02	Silicon	MC	Zirconium	0.009
Erbium	<0.002	Mercury	NR	Silver	0.001		
Europium	<0.002	Molybdenum	0.06	Sodium	>4		

NR - Not Reported

MC - Major Component

TABLE D10. SSMS DATA FOR SAMPLE 021714 MT.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.09	Fluorine	≃0.4	Neodymium	<0.003	Strontium	1
Antimony	<0.003	Gadolinium	<0.003	Nickel	0.03	Sulfur	MC
Arsenic	0.01	Gallium	≤0.009	Niobium	<0.003	Tantalum	<0.003
Barium	0.6	Germanium	<0.003	Osmium	<0.003	Tellurium	<0.003
Beryllium	<0.003	Gold	<0.003	Palladium	<0.003	Terbium	<0.003
Bismuth	<0.003	Hafnium	<0.003	Phosphorus	0.06	Thallium	<0.003
Boron	0.3	Holmium	<0.003	Platinum	<0.003	Thorium	<0.003
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.003
Cadmium	0.02	Iodine	0.03	Praseodymium	<0.003	Tin	<0.003
Calcium	MC	Iridium	<0.003	Rhenium	<0.003	Titanium	0.04
Cerium	0.006	Iron	1	Rhodium	<0.003	Tungsten	<0.003
Cesium	0.009	Lanthanum	0.006	Rubidium	0.09	Uranium	0.06
Chlorine	0.3	Lead	0.05	Ruthenium	<0.003	Vanadium	0.008
Chromium	0.006	Lithium	0.1	Samarium	<0.003	Ytterbium	<0.003
Cobalt	0.008	Lutetium	<0.003	Scandium	≤0.003	Yttrium	0.004
Copper	0.09	Magnesium	5	Selenium	0.01	Zinc	2
Dysprosium	<0.003	Manganese	0.9	Silicon	2	Zirconium	0.04
Erbium	<0.003	Mercury	NR	Silver	<0.003		
Europium	<0.003	Molybdenum	0.6	Sodium	>7		

NR - Not reported

MC - Major component

TABLE D11. SSMS DATA FOR SAMPLE 021714 MD.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈0.2	Neodymium	<0.003	Strontium	0.3
Antimony	<0.003	Gadolinium	<0.003	Nickel	0.04	Sulfur	MC
Arsenic	0.006	Gallium	0.004	Niobium	<0.003	Tantalum	<0.003
Barium	0.1	Germanium	<0.003	Osmium	<0.003	Tellurium	<0.003
Beryllium	<0.003	Gold	<0.003	Palladium	<0.003	Terbium	<0.003
Bismuth	<0.003	Hafnium	<0.003	Phosphorus	0.1	Thallium	<0.003
Boron	0.3	Holmium	<0.003	Platinum	<0.003	Thorium	<0.003
Bromine	0.09	Indium	STD	Potassium	MC	Thulium	<0.003
Cadmium	0.009	Iodine	0.006	Praseodymium	<0.003	Tin	<0.003
Calcium	MC	Iridium	<0.003	Rhenium	<0.003	Titanium	0.03
Cerium	<0.003	Iron	0.07	Rhodium	<0.003	Tungsten	<0.003
Cesium	0.01	Lanthanum	<0.003	Rubidium	0.09	Uranium	≤0.02
Chlorine	0.2	Lead	0.02	Ruthenium	<0.003	Vanadium	0.002
Chromium	0.008	Lithium	0.2	Samarium	<0.003	Ytterbium	<0.003
Cobalt	0.008	Lutetium	<0.003	Scandium	≤0.003	Yttrium	≤0.02
Copper	0.002	Magnesium	3	Selenium	0.004	Zinc	0.7
Dysprosium	<0.003	Manganese	0.3	Silicon	0.9	Zirconium	0.04
Erbium	<0.003	Mercury	NR	Silver	0.003		
Europium	<0.003	Molybdenum	0.1	Sodium	>7		

NR - Not reported

MC - Major Component

TABLE D12. SSMS DATA FOR SAMPLE 021715 MD.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.06	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>7
Arsenic	0.002	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.3	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	0.002	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	0.002	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	<0.001	Iron	0.06	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	0.04
Chlorine	0.5	Lead	0.005	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.003	Lithium	0.007	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.004
Copper	0.04	Magnesium	5	Selenium	0.002	Zinc	0.6
Dysprosium	<0.001	Manganese	1	Silicon	0.8	Zirconium	0.03
Erbium	<0.001	Mercury	MC	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>3		

NR - Not reported

MC - Major component

TABLE D13. SSMS DATA FOR SAMPLE 021715 MT.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.5	Neodymium	<0.003	Strontium	0.1
Antimony	<0.003	Gadolinium	<0.003	Nickel	0.03	Sulfur	MC
Arsenic	0.007	Gallium	<0.003	Niobium	<0.003	Tantalum	<0.003
Barium	0.3	Germanium	<0.003	Osmium	<0.003	Tellurium	<0.003
Beryllium	<0.003	Gold	<0.003	Palladium	<0.003	Terbium	<0.003
Bismuth	<0.003	Hafnium	<0.003	Phosphorus	0.1	Thallium	<0.003
Boron	0.002	Holmium	<0.003	Platinum	<0.003	Thorium	<0.003
Bromine	0.07	Indium	STD	Potassium	MC	Thulium	<0.003
Cadmium	<0.003	Iodine	0.02	Praseodymium	<0.003	Tin	<0.003
Calcium	MC	Iridium	<0.003	Rhenium	<0.003	Titanium	0.1
Cerium	<0.003	Iron	0.8	Rhodium	<0.003	Tungsten	<0.003
Cesium	0.003	Lanthanum	<0.003	Rubidium	0.007	Uranium	0.05
Chlorine	0.8	Lead	0.04	Ruthenium	<0.003	Vanadium	≤0.005
Chromium	0.009	Lithium	0.005	Samarium	<0.003	Ytterbium	<0.003
Cobalt	0.002	Lutetium	<0.003	Scandium	≤0.004	Yttrium	0.002
Copper	0.04	Magnesium	4	Selenium	≤0.01	Zinc	2
Dysprosium	<0.003	Manganese	1	Silicon	1	Zirconium	0.07
Erbium	<0.003	Mercury	NR	Silver	< 0.003		
Europium	<0.003	Molybdenum	0.09	Sodium	>8		

NR - Not reported

MC - Major component

TABLE D14. SSMS DATA FOR SAMPLE 021720 MT.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	0.2	Neodymium	<0.001	Strontium	0.08
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	>7
Arsenic	0.008	Gallium	≤0.002	Niobium	<0.001	Tantalum	<0.001
Barium	0.06	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.04	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.002	Iodine	0.005	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	<0.001	Iron	0.03	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	≤0.009
Chlorine	MC	Lead	0.005	Ruthenium	<0.001	Vanadium	0.004
Chromium	0.003	Lithium	0.002	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.002
Copper	0.02	Magnesium	MC	Selenium	0.002	Zinc	0.2
Dysprosium	<0.001	Manganese	0.003	Silicon	0.8	Zirconium	0.06
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.1	Sodium	>3		

NR - Not reported

INT - Interference

MC - Major component

TABLE D15. SSMS DATA FOR SAMPLE 021720 MD.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈0.3	Neodymium	<0.001	Strontium	0.4
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>7
Arsenic	0.03	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.5	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	4	Thallium	<0.001
Boron	0.004	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.002	Iodine	0.01	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.1
Cerium	0.002	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.03	Lanthanum	0.003	Rubidium	0.004	Uranium	0.03
Chlorine	4	Lead	0.02	Ruthenium	<0.001	Vanadium	0.02
Chromium	0.03	Lithium	0.03	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.004
Copper	0.1	Magnesium	MC	Selenium	0.003	Zinc	0.3
Dysprosium	<0.001	Manganese	0.02	Silicon	0.9	Zirconium	0.02
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.1	Sodium	>3		

NR - Not reported

MC - Major component

TABLE D16. SSMS DATA FOR SAMPLE 021726 MD

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.09	Fluorine	≈1	Neodymium	<0.008	Strontium	1
Antimony	<0.008	Gadolinium	<0.008	Nickel	0.04	Sulfur	MC
Arsenic	0.04	Gallium	<0.008	Niobium	<0.008	Tantalum	<0.008
Barium	0.2	Germanium	<0.008	Osmium	<0.008	Tellurium	<0.008
Beryllium	<0.008	Gold	<0.008	Palladium	<0.008	Terbium	<0.008
Bismuth	<0.008	Hafnium	<0.008	Phosphorus	6	Thallium	<0.008
Boron	0.08	Holmium	<0.008	Platinum	<0.008	Thorium	<0.008
Bromine	0.08	Indium	STD	Potassium	MC	Thulium	<0.008
Cadmium	<0.008	Iodine	0.03	Praseodymium	<0.008	Tin	<0.008
Calcium	MC	Iridium	<0.008	Rhenium	<0.008	Titanium	*0.7
Cerium	<0.008	Iron	0.4	Rhodium	<0.008	Tungsten	<0.008
Cesium	<0.008	Lanthanum	<0.008	Rubidium	0.008	Uranium	0.07
Chlorine	0.5	Lead	0.04	Ruthenium	<0.008	Vanadium	0.003
Chromium	≤0.02	Lithium	0.08	Samarium	<0.008	Ytterbium	<0.008
Cobalt	≤0.007	Lutetium	<0.008	Scandium	≤0.005	Yttrium	<0.008
Copper	0.05	Magnesium	MC	Selenium	0.04	Zinc	0.06
Dysprosium	<0.008	Manganese	0.03	Silicon	7	Zirconium	0.01
Erbium	<0.008	Mercury	NR	Silver	<0.008		
Europium	<0.008	Molybdenum	*0.07	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D17. SSMS DATA FOR SAMPLE 021726 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈0.8	Neodymium	<0.008	Strontium	1
Antimony	<0.008	Gadolinium	<0.008	Nickel	0.02	Sulfur	MC
Arsenic	0.04	Gallium	<0.008	Niobium	<0.008	Tantalum	<0.008
Barium	4	Germanium	<0.008	Osmium	<0.008	Tellurium	<0.008
Beryllium	<0.008	Gold	<0.008	Palladium	<0.008	Terbium	<0.008
Bismuth	<0.008	Hafnium	<0.008	Phosphorus	MC	Thallium	<0.008
Boron	0.08	Holmium	<0.008	Platinum	<0.008	Thorium	<0.008
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	<0.008
Cadmium	<0.008	Iodine	0.02	Praseodymium	<0.008	Tin	<0.008
Calcium	MC	Iridium	<0.008	Rhenium	<0.008	Titanium	0.2
Cerium	0.02	Iron	0.7	Rhodium	<0.008	Tungsten	<0.008
Cesium	<0.008	Lanthanum	0.02	Rubidium	0.007	Uranium	<0.008
Chlorine	0.8	Lead	<0.008	Ruthenium	<0.008	Vanadium	0.005
Chromium	≤0.02	Lithium	0.5	Samarium	<0.008	Ytterbium	<0.008
Cobalt	≤0.01	Lutetium	<0.008	Scandium	≤0.005	Yttrium	<0.008
Copper	0.08	Magnesium	MC	Selenium	≤0.09	Zinc	0.1
Dysprosium	<0.008	Manganese	0.1	Silicon	MC	Zirconium	0.01
Erbium	<0.008	Mercury	NR	Silver	<0.008		
Europium	<0.008	Molybdenum	0.07	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D18. SSMS DATA FOR SAMPLE 021731 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈1	Neodymium	<0.004	Strontium	0.5
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.007	Sulfur	MC
Arsenic	0.008	Gallium	<0.004	Niobium	<0.004	Tantalum	<0.004
Barium	1	Germanium	<0.004	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	5	Thallium	<0.004
Boron	0.004	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	0.01	Iodine	0.006	Praseodymium	<0.004	Tin	0.01
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.05
Cerium	<0.004	Iron	0.4	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	<0.004	Rubidium	0.004	Uranium	0.04
Chlorine	0.2	Lead	0.02	Ruthenium	<0.004	Vanadium	0.01
Chromium	≤0.005	Lithium	0.02	Samarium	<0.004	Ytterbium	<0.004
Cobalt	≤0.001	Lutetium	<0.004	Scandium	≤0.002	Yttrium	<0.004
Copper	0.2	Magnesium	MC	Selenium	0.04	Zinc	0.06
Dysprosium	<0.004	Manganese	0.009	Silicon	2	Zirconium	0.01
Erbium	<0.004	Mercury	NR	Silver	0.004		
Europium	<0.004	Molybdenum	0.04	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D19. SSMS DATA FOR SAMPLE 021733 MT.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈0.3	Neodymium	<0.004	Strontium	0.6
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.04	Sulfur	MC
Arsenic	0.008	Gallium	<0.004	Niobium	<0.004	Tantalum	<0.004
Barium	0.1	Germanium	<0.004	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.2	Thallium	<0.004
Boron	0.09	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.07	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	<0.004	Iodine	<0.004	Praseodymium	<0.004	Tin	<0.004
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.04
Cerium	<0.004	Iron	0.9	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	<0.004	Rubidium	0.01	Uranium	0.03
Chlorine	2	Lead	0.02	Ruthenium	<0.004	Vanadium	0.001
Chromium	0.01	Lithium	0.05	Samarium	<0.004	Ytterbium	<0.004
Cobalt	0.003	Lutetium	<0.004	Scandium	≤0.004	Yttrium	<0.004
Copper	0.05	Magnesium	MC	Selenium	≤0.006	Zinc	1
Dysprosium	<0.004	Manganese	0.04	Silicon	1	Zirconium	0.06
Erbium	<0.004	Mercury	NR	Silver	<0.004		
Europium	<0.004	Molybdenum	0.1	Sodium	>10		

NR - Not reported

MC - Major component

TABLE D20. SSMS DATA FOR SAMPLE 021733 MD.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈0.2	Neodymium	< 0.007	Strontium	0.5
Antimony	< 0.007	Gadolinium	< 0.007	Nickel	0.1	Sulfur	MC
Arsenic	0.03	Gallium	< 0.007	Niobium	< 0.007	Tantalum	< 0.007
Barium	0.6	Germanium	< 0.007	Osmium	< 0.007	Tellurium	< 0.007
Beryllium	< 0.007	Gold	< 0.007	Palladium	< 0.007	Terbium	< 0.007
Bismuth	< 0.007	Hafnium	< 0.007	Phosphorus	0.5	Thallium	< 0.007
Boron	0.005	Holmium	< 0.007	Platinum	< 0.007	Thorium	< 0.007
Bromine	0.3	Indium	STD	Potassium	10	Thulium	< 0.007
Cadmium	< 0.007	Iodine	0.03	Praseodymium	< 0.007	Tin	< 0.007
Calcium	MC	Iridium	< 0.007	Rhenium	< 0.007	Titanium	0.4
Cerium	< 0.007	Iron	1	Rhodium	< 0.007	Tungsten	< 0.007
Cesium	0.03	Lanthanum	< 0.007	Rubidium	0.007	Uranium	≤0.07
Chlorine	2	Lead	≤0.03	Ruthenium	< 0.007	Vanadium	0.02
Chromium	0.02	Lithium	0.03	Samarium	< 0.007	Ytterbium	< 0.007
Cobalt	0.006	Lutetium	< 0.007	Scandium	≤0.009	Yttrium	< 0.007
Copper	0.1	Magnesium	5	Selenium	≤0.01	Zinc	0.3
Dysprosium	< 0.007	Manganese	0.1	Silicon	MC	Zirconium	0.2
Erbium	< 0.007	Mercury	NR	Silver	< 0.007		
Europium	< 0.007	Molybdenum	0.2	Sodium	MC		

NR - Not reported

MC - Major component

TABLE D21. SSMS DATA FOR SAMPLE 021736 MD

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈0.01	Neodymium	<0.007	Strontium	0.6
Antimony	<0.007	Gadolinium	<0.007	Nickel	0.03	Sulfur	MC
Arsenic	0.2	Gallium	0.01	Niobium	0.01	Tantalum	<0.007
Barium	0.4	Germanium	0.04	Osmium	<0.007	Tellurium	<0.007
Beryllium	<0.007	Gold	<0.007	Palladium	<0.007	Terbium	<0.007
Bismuth	<0.007	Hafnium	<0.007	Phosphorus	0.3	Thallium	<0.007
Boron	0.06	Holmium	<0.007	Platinum	<0.007	Thorium	<0.007
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.007
Cadmium	0.02	Iodine	0.01	Praseodymium	<0.007	Tin	<0.007
Calcium	MC	Iridium	<0.007	Rhenium	<0.007	Titanium	0.2
Cerium	0.02	Iron	1	Rhodium	<0.007	Tungsten	<0.007
Cesium	<0.007	Lanthanum	0.02	Rubidium	0.03	Uranium	0.1
Chlorine	1	Lead	0.07	Ruthenium	<0.007	Vanadium	0.01
Chromium	0.04	Lithium	0.1	Samarium	<0.007	Ytterbium	<0.007
Cobalt	0.006	Lutetium	<0.007	Scandium	≤0.005	Yttrium	0.01
Copper	0.1	Magnesium	MC	Selenium	0.02	Zinc	0.4
Dysprosium	<0.007	Manganese	0.09	Silicon	3	Zirconium	0.04
Erbium	<0.007	Mercury	NR	Silver	0.008		
Europium	<0.007	Molybdenum	0.09	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D22. SSMS DATA FOR SAMPLE 021736 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	5	Fluorine	≈0.2	Neodymium	<0.004	Strontium	0.6
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.07	Sulfur	MC
Arsenic	0.3	Gallium	0.003	Niobium	0.005	Tantalum	<0.004
Barium	0.3	Germanium	0.02	Osmium	<0.004	Tellurium	<0.004
Beryllium	0.001	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.2	Thallium	<0.004
Boron	0.4	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.07	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	0.006	Iodine	0.004	Praseodymium	<0.004	Tin	<0.004
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.1
Cerium	0.02	Iron	2	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	0.03	Rubidium	0.07	Uranium	0.03
Chlorine	0.4	Lead	≤0.01	Ruthenium	<0.004	Vanadium	0.02
Chromium	0.02	Lithium	0.2	Samarium	<0.004	Ytterbium	0.01
Cobalt	0.006	Lutetium	<0.004	Scandium	≤0.002	Yttrium	0.01
Copper	0.05	Magnesium	MC	Selenium	≤0.05	Zinc	0.2
Dysprosium	<0.004	Manganese	0.2	Silicon	2	Zirconium	0.02
Erbium	<0.004	Mercury	NR	Silver	<0.004		
Europium	<0.004	Molybdenum	0.03	Sodium	>10		

NR - Not Reported

MC - Major Component

TABLE D23. SSMS DATA FOR SAMPLE 021739 MT.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	≥1	Fluorine	≈0.4	Neodymium	< 0.001	Strontium	0.7
Antimony	0.02	Gadolinium	< 0.001	Nickel	0.01	Sulfur	>7
Arsenic	0.1	Gallium	< 0.001	Niobium	< 0.001	Tantalum	< 0.001
Barium	0.5	Germanium	< 0.001	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.8	Thallium	< 0.001
Boron	0.07	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	0.002	Iodine	0.01	Praseodymium	< 0.001	Tin	< 0.001
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.01
Cerium	0.003	Iron	0.7	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	0.004	Lanthanum	0.003	Rubidium	0.02	Uranium	0.1
Chlorine	1	Lead	0.05	Ruthenium	< 0.001	Vanadium	0.009
Chromium	0.004	Lithium	0.04	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	<0.001	Lutetium	< 0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.2	Magnesium	MC	Selenium	0.007	Zinc	0.3
Dysprosium	< 0.001	Manganese	0.1	Silicon	1	Zirconium	0.02
Erbium	< 0.001	Mercury	NR	Silver	0.04		
Europium	< 0.001	Molybdenum	0.1	Sodium	>3		

NR - Not reported

MC - Major component

TABLE D24. SSMS DATA FOR SAMPLE 021739 MD.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈0.2	Neodymium	<0.006	Strontium	0.5
Antimony	<0.006	Gadolinium	<0.006	Nickel	0.07	Sulfur	MC
Arsenic	0.1	Gallium	<0.006	Niobium	<0.006	Tantalum	<0.006
Barium	0.6	Germanium	<0.006	Osmium	<0.006	Tellurium	<0.006
Beryllium	<0.006	Gold	<0.006	Palladium	<0.006	Terbium	<0.006
Bismuth	<0.006	Hafnium	<0.006	Phosphorus	0.3	Thallium	<0.006
Boron	0.3	Holmium	<0.006	Platinum	<0.006	Thorium	<0.006
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.006
Cadmium	<0.006	Iodine	0.007	Praseodymium	<0.006	Tin	<0.006
Calcium	MC	Iridium	<0.006	Rhenium	<0.006	Titanium	0.08
Cerium	<0.006	Iron	0.4	Rhodium	<0.006	Tungsten	<0.006
Cesium	<0.006	Lanthanum	<0.006	Rubidium	0.02	Uranium	≤0.05
Chlorine	3	Lead	0.03	Ruthenium	<0.006	Vanadium	0.01
Chromium	0.008	Lithium	0.2	Samarium	<0.006	Ytterbium	<0.006
Cobalt	0.005	Lutetium	<0.006	Scandium	≤0.008	Yttrium	<0.006
Copper	0.03	Magnesium	MC	Selenium	0.01	Zinc	4
Dysprosium	<0.006	Manganese	0.05	Silicon	2	Zirconium	0.1
Erbium	<0.006	Mercury	NR	Silver	<0.006		
Europium	<0.006	Molybdenum	0.3	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D25. SSMS DATA FOR SAMPLE 021744 MD

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	2	Fluorine	≈0.5	Neodymium	<0.002	Strontium	0.6
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.02	Sulfur	>9
Arsenic	0.01	Gallium	0.005	Niobium	0.03	Tantalum	<0.002
Barium	0.6	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.5	Thallium	<0.002
Boron	0.03	Holmium	<0.002	Platinum	<0.002	Thorium	0.01
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.004	Iodine	0.02	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.2
Cerium	0.007	Iron	0.9	Rhodium	<0.002	Tungsten	0.007
Cesium	0.002	Lanthanum	0.007	Rubidium	0.01	Uranium	0.1
Chlorine	0.8	Lead	0.02	Ruthenium	<0.002	Vanadium	0.03
Chromium	0.02	Lithium	0.05	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.003	Lutetium	<0.002	Scandium	≤0.001	Yttrium	0.002
Copper	0.09	Magnesium	MC	Selenium	0.04	Zinc	0.8
Dysprosium	<0.002	Manganese	0.03	Silicon	0.5	Zirconium	0.03
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.2	Sodium	>4		

NR - Not Reported

MC - Major Component

TABLE D26. SSMS DATA FOR SAMPLE 021744 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.07	Neodymium	<0.01	Strontium	0.3
Antimony	0.03	Gadolinium	<0.01	Nickel	0.02	Sulfur	7
Arsenic	0.009	Gallium	0.007	Niobium	<0.01	Tantalum	<0.01
Barium	0.5	Germanium	<0.01	Osmium	<0.01	Tellurium	<0.01
Beryllium	<0.01	Gold	<0.01	Palladium	<0.01	Terbium	<0.01
Bismuth	<0.01	Hafnium	<0.01	Phosphorus	0.4	Thallium	<0.01
Boron	0.2	Holmium	<0.01	Platinum	<0.01	Thorium	<0.01
Bromine	0.4	Indium	STD	Potassium	MC	Thulium	<0.01
Cadmium	0.03	Iodine	0.04	Praseodymium	<0.01	Tin	<0.01
Calcium	MC	Iridium	<0.01	Rhenium	<0.01	Titanium	0.1
Cerium	<0.01	Iron	0.5	Rhodium	<0.01	Tungsten	<0.01
Cesium	<0.01	Lanthanum	<0.01	Rubidium	0.02	Uranium	≤0.07
Chlorine	0.5	Lead	0.04	Ruthenium	<0.01	Vanadium	0.03
Chromium	0.02	Lithium	0.1	Samarium	<0.01	Ytterbium	<0.01
Cobalt	0.005	Lutetium	<0.01	Scandium	≤0.006	Yttrium	0.01
Copper	0.06	Magnesium	4	Selenium	0.01	Zinc	0.2
Dysprosium	<0.01	Manganese	0.05	Silicon	1	Zirconium	0.2
Erbium	<0.01	Mercury	NR	Silver	0.02		
Europium	<0.01	Molybdenum	0.2	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D27. SSMS DATA FOR SAMPLE 021755 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈0.07	Neodymium	<0.002	Strontium	0.1
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.03	Sulfur	MC
Arsenic	0.008	Gallium	0.005	Niobium	<0.002	Tantalum	<0.002
Barium	0.09	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.3	Thallium	<0.002
Boron	0.02	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.006	Iodine	0.02	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.03
Cerium	0.005	Iron	2	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	0.005	Rubidium	0.007	Uranium	0.03
Chlorine	0.5	Lead	0.03	Ruthenium	<0.002	Vanadium	0.004
Chromium	0.1	Lithium	0.007	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.004	Lutetium	<0.002	Scandium	≤0.001	Yttrium	0.002
Copper	0.1	Magnesium	MC	Selenium	0.05	Zinc	0.3
Dysprosium	<0.002	Manganese	0.1	Silicon	0.7	Zirconium	<0.002
Erbium	<0.002	Mercury	NR	Silver	0.006		
Europium	<0.002	Molybdenum	0.02	Sodium	>5		

NR - Not Reported

MC - Major Component

TABLE D28. SSMS DATA FOR SAMPLE 021745 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.5	Neodymium	<0.004	Strontium	0.3
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.02	Sulfur	MC
Arsenic	0.004	Gallium	0.003	Niobium	<0.004	Tantalum	<0.004
Barium	0.3	Germanium	<0.004	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	0.007	Hafnium	<0.004	Phosphorus	0.7	Thallium	<0.004
Boron	0.009	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	0.01	Iodine	0.01	Praseodymium	<0.004	Tin	<0.004
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.03
Cerium	<0.004	Iron	0.2	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	<0.004	Rubidium	0.01	Uranium	0.03
Chlorine	0.7	Lead	0.03	Ruthenium	<0.004	Vanadium	0.002
Chromium	0.004	Lithium	0.02	Samarium	<0.004	Ytterbium	<0.004
Cobalt	0.002	Lutetium	<0.004	Scandium	≤0.002	Yttrium	≤0.003
Copper	0.05	Magnesium	7	Selenium	0.02	Zinc	0.1
Dysprosium	<0.004	Manganese	0.08	Silicon	1	Zirconium	0.008
Erbium	<0.004	Mercury	NR	Silver	0.007		
Europium	<0.004	Molybdenum	0.03	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D29. SSMS DATA FOR SAMPLE 021749 MT

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.7	Neodymium	<0.01	Strontium	2
Antimony	<0.01	Gadolinium	<0.01	Nickel	0.04	Sulfur	MC
Arsenic	0.008	Gallium	0.007	Niobium	<0.01	Tantalum	<0.01
Barium	0.4	Germanium	<0.01	Osmium	<0.01	Tellurium	<0.01
Beryllium	<0.01	Gold	<0.01	Palladium	<0.01	Terbium	<0.01
Bismuth	<0.01	Hafnium	<0.01	Phosphorus	0.2	Thallium	<0.01
Boron	0.09	Holmium	<0.01	Platinum	<0.01	Thorium	<0.01
Bromine	0.4	Indium	STD	Potassium	MC	Thulium	<0.01
Cadmium	<0.01	Iodine	0.04	Praseodymium	<0.01	Tin	<0.01
Calcium	MC	Iridium	<0.01	Rhenium	<0.01	Titanium	0.1
Cerium	<0.01	Iron	0.5	Rhodium	<0.01	Tungsten	<0.01
Cesium	<0.01	Lanthanum	<0.01	Rubidium	0.008	Uranium	<0.01
Chlorine	1	Lead	0.04	Ruthenium	<0.01	Vanadium	0.02
Chromium	0.04	Lithium	0.06	Samarium	<0.01	Ytterbium	<0.01
Cobalt	0.007	Lutetium	<0.01	Scandium	≤0.006	Yttrium	<0.01
Copper	0.05	Magnesium	MC	Selenium	0.01	Zinc	0.2
Dysprosium	<0.01	Manganese	0.01	Silicon	0.7	Zirconium	<0.01
Erbium	<0.01	Mercury	NR	Silver	<0.01		
Europium	<0.01	Molybdenum	0.1	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D30. SSMS DATA FOR SAMPLE 021749 MD

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	1	Fluorine	≈0.3	Neodymium	<0.008	Strontium	1
Antimony	<0.008	Gadolinium	<0.008	Nickel	0.01	Sulfur	MC
Arsenic	0.02	Gallium	0.03	Niobium	<0.008	Tantalum	<0.008
Barium	0.7	Germanium	<0.008	Osmium	<0.008	Tellurium	<0.008
Beryllium	<0.008	Gold	<0.008	Palladium	<0.008	Terbium	<0.008
Bismuth	<0.008	Hafnium	<0.008	Phosphorus	0.4	Thallium	<0.008
Boron	0.07	Holmium	<0.008	Platinum	<0.008	Thorium	<0.008
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.008
Cadmium	0.01	Iodine	0.02	Praseodymium	<0.008	Tin	<0.008
Calcium	MC	Iridium	<0.008	Rhenium	<0.008	Titanium	0.4
Cerium	<0.008	Iron	0.4	Rhodium	<0.008	Tungsten	<0.008
Cesium	0.01	Lanthanum	<0.008	Rubidium	0.02	Uranium	0.1
Chlorine	0.4	Lead	0.06	Ruthenium	<0.008	Vanadium	0.03
Chromium	0.02	Lithium	0.09	Samarium	<0.008	Ytterbium	<0.008
Cobalt	0.003	Lutetium	<0.008	Scandium	≤0.005	Yttrium	0.006
Copper	0.05	Magnesium	9	Selenium	≤0.05	Zinc	0.2
Dysprosium	<0.008	Manganese	0.02	Silicon	1	Zirconium	0.02
Erbium	<0.008	Mercury	NR	Silver	<0.008		
Europium	<0.008	Molybdenum	0.07	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D31. SSMS DATA FOR SAMPLE FLY ASH LELAND OLDS

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈250	Neodymium	6	Strontium	MC
Antimony	4	Gadolinium	2	Nickel	9	Sulfur	MC
Arsenic	45	Gallium	24	Niobium	8	Tantalum	< 0.2
Barium	MC	Germanium	4	Osmium	< 0.2	Tellurium	< 0.2
Beryllium	3	Gold	< 0.2	Palladium	< 0.2	Terbium	0.7
Bismuth	0.3	Hafnium	1	Phosphorus	MC	Thallium	0.8
Boron	380	Holmium	2	Platinum	< 0.2	Thorium	15
Bromine	3	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	0.3	Iodine	< 0.2	Praseodymium	2	Tin	0.7
Calcium	MC	Iridium	< 0.2	Rhenium	< 0.2	Titanium	MC
Cerium	38	Iron	MC	Rhodium	< 0.2	Tungsten	4
Cesium	2	Lanthanum	34	Rubidium	14	Uranium	14
Chlorine	73	Lead	24	Ruthenium	< 0.2	Vanadium	82
Chromium	41	Lithium	8	Samarium	7	Ytterbium	2
Cobalt	6	Lutetium	0.4	Scandium	8	Yttrium	21
Copper	49	Magnesium	MC	Selenium	4	Zinc	24
Dysprosium	3	Manganese	210	Silicon	MC	Zirconium	100
Erbium	1	Mercury	NR	Silver	0.3		
Europium	0.9	Molybdenum	8	Sodium	MC		

NR - Not Reported
MC - Major component

TABLE D32. SSMS DATA FOR SAMPLE FLY ASH MILTON YOUNG

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈130	Neodymium	7	Strontium	MC
Antimony	6	Gadolinium	2	Nickel	38	Sulfur	MC
Arsenic	77	Gallium	30	Niobium	19	Tantalum	<0.1
Barium	MC	Germanium	9	Osmium	<0.1	Tellurium	0.7
Beryllium	2	Gold	<0.1	Palladium	<0.1	Terbium	0.8
Bismuth	0.7	Hafnium	2	Phosphorus	MC	Thallium	1
Boron	580	Holmium	1	Platinum	<0.1	Thorium	32
Bromine	2	Indium	STD	Potassium	MC	Thulium	0.3
Cadmium	0.7	Iodine	0.6	Praseodymium	5	Tin	2
Calcium	MC	Iridium	<0.1	Rhenium	<0.1	Titanium	MC
Cerium	24	Iron	MC	Rhodium	<0.1	Tungsten	4
Cesium	5	Lanthanum	42	Rubidium	32	Uranium	14
Chlorine	13	Lead	67	Ruthenium	<0.1	Vanadium	150
Chromium	MC	Lithium	26	Samarium	8	Ytterbium	2
Cobalt	16	Lutetium	0.5	Scandium	5	Yttrium	24
Copper	50	Magnesium	MC	Selenium	5	Zinc	130
Dysprosium	2	Manganese	≥940	Silicon	MC	Zirconium	130
Erbium	0.9	Mercury	NR	Silver	0.4		
Europium	1	Molybdenum	10	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D33. SSMS DATA FOR SAMPLE FLY ASH BIG STONE

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈200	Neodymium	10	Strontium	MC
Antimony	3	Gadolinium	1	Nickel	6	Sulfur	MC
Arsenic	20	Gallium	21	Niobium	16	Tantalum	<0.2
Barium	MC	Germanium	3	Osmium	<0.2	Tellurium	≤0.3
Beryllium	0.8	Gold	<0.2	Palladium	<0.2	Terbium	0.4
Bismuth	0.3*	Hafnium	2	Phosphorus	320	Thallium	0.4
Boron	MC	Holmium	0.8	Platinum	<0.2	Thorium	15
Bromine	2	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	0.5	Iodine	0.5	Praseodymium	2	Tin	3
Calcium	MC	Iridium	<0.2	Rhenium	<0.2	Titanium	MC
Cerium	37	Iron	MC	Rhodium	<0.2	Tungsten	1
Cesium	0.9	Lanthanum	19	Rubidium	12	Uranium	12
Chlorine	35	Lead	26	Ruthenium	<0.2	Vanadium	27
Chromium	32	Lithium	440	Samarium	3	Ytterbium	1
Cobalt	2	Lutetium	0.2	Scandium	11	Yttrium	21
Copper	47	Magnesium	MC	Selenium	7	Zinc	9
Dysprosium	1	Manganese	≥MC	Silicon	MC	Zirconium	91
Erbium	0.6	Mercury	NR	Silver	0.5		
Europium	0.5	Molybdenum	7	Sodium	MC		

NR - Not Reported

MC - Major component

* Heterogeneous

TABLE D34. SSMS DATA FOR SAMPLE FLY ASH HOOT LAKE

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≃ 440	Neodymium	8	Strontium	MC
Antimony	2	Gadolinium	4	Nickel	6	Sulfur	MC
Arsenic	33	Gallium	42	Niobium	32	Tantalum	< 0.2
Barium	MC	Germanium	5	Osmium	< 0.2	Tellurium	< 0.2
Beryllium	0.5	Gold	< 0.2	Palladium	< 0.2	Terbium	1
Bismuth	< 0.2	Hafnium	2	Phosphorus	MC	Thallium	≤ 0.7
Boron	200	Holmium	2	Platinum	< 0.2	Thorium	17
Bromine	6	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	0.5	Iodine	0.2	Praseodymium	7	Tin	3
Calcium	MC	Iridium	< 0.2	Rhenium	< 0.2	Titanium	MC
Cerium	41	Iron	MC	Rhodium	< 0.2	Tungsten	2
Cesium	1	Lanthanum	41	Rubidium	14	Uranium	12
Chlorine	71	Lead	23	Ruthenium	< 0.2	Vanadium	47
Chromium	40	Lithium	10	Samarium	8	Ytterbium	2
Cobalt	3	Lutetium	0.2	Scandium	20	Yttrium	23
Copper	21	Magnesium	MC	Selenium	9	Zinc	23
Dysprosium	3	Manganese	320	Silicon	MC	Zirconium	230
Erbium	1	Mercury	NR	Silver	0.3		
Europium	2	Molybdenum	7	Sodium	MC		

NR - Not Reported
MC - Major component

TABLE D35. SSMS DATA FOR SAMPLE FLY ASH UPA

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈180	Neodymium	4	Strontium	MC
Antimony	1	Gadolinium	2	Nickel	16	Sulfur	MC
Arsenic	32	Gallium	20	Niobium	17	Tantalum	<0.1
Barium	MC	Germanium	5	Osmium	<0.1	Tellurium	<0.1
Beryllium	2	Gold	<0.1	Palladium	<0.1	Terbium	0.7
Bismuth	≤0.3	Hafnium	2	Phosphorus	MC	Thallium	2
Boron	MC	Holmium	1	Platinum	<0.1	Thorium	16
Bromine	3	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	0.4	Iodine	<0.1	Praseodymium	2	Tin	1
Calcium	MC	Iridium	<0.1	Rhenium	<0.1	Titanium	MC
Cerium	22	Iron	MC	Rhodium	<0.1	Tungsten	2
Cesium	1	Lanthanum	21	Rubidium	26	Uranium	12
Chlorine	19	Lead	22	Ruthenium	<0.1	Vanadium	46
Chromium	39	Lithium	21	Samarium	4	Ytterbium	2
Cobalt	9	Lutetium	0.2	Scandium	9	Yttrium	17
Copper	41	Magnesium	MC	Selenium	5	Zinc	22
Dysprosium	2	Manganese	150	Silicon	MC	Zirconium	98
Erbium	0.9	Mercury	NR	Silver	0.3		
Europium	0.9	Molybdenum	4	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE D36. SSMS DATA FOR SAMPLE FLY ASH 0120-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈460	Neodymium	5	Strontium	MC
Antimony	6	Gadolinium	0.8	Nickel	4	Sulfur	MC
Arsenic	81	Gallium	13	Niobium	10	Tantalum	<0.1
Barium	MC	Germanium	5	Osmium	<0.1	Tellurium	≤2
Beryllium	0.4	Gold	<0.1	Palladium	<0.1	Terbium	0.3
Bismuth	0.3	Hafnium	<0.1	Phosphorus	MC	Thallium	0.5
Boron	200	Holmium	0.5	Platinum	<0.1	Thorium	4
Bromine	8	Indium	STD	Potassium	MC	Thulium	<0.1
Cadmium	0.3	Iodine	3	Praseodymium	2	Tin	2
Calcium	MC	Iridium	<0.1	Rhenium	<0.1	Titanium	MC
Cerium	13	Iron	MC	Rhodium	<0.1	Tungsten	1
Cesium	3	Lanthanum	13	Rubidium	19	Uranium	8
Chlorine	55	Lead	8*	Ruthenium	<0.1	Vanadium	59
Chromium	28	Lithium	3	Samarium	5	Ytterbium	0.1
Cobalt	3	Lutetium	<0.1	Scandium	3	Yttrium	13
Copper	53	Magnesium	MC	Selenium	10	Zinc	14
Dysprosium	0.8	Manganese	120	Silicon	MC	Zirconium	63
Erbium	0.3	Mercury	<0.1	Silver	0.3		
Europium	0.6	Molybdenum	11	Sodium	MC		

MC - Major Component
*Heterogeneous

TABLE D37. SSMS DATA FOR SAMPLE FLY ASH 10-3

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈510	Neodymium	7	Strontium	MC
Antimony	8	Gadolinium	1	Nickel	13	Sulfur	MC
Arsenic	76	Gallium	21	Niobium	8	Tantalum	< 0.2
Barium	MC	Germanium	7	Osmium	< 0.2	Tellurium	< 0.2
Beryllium	1	Gold	< 0.2	Palladium	< 0.2	Terbium	0.4
Bismuth	0.3	Hafnium	1	Phosphorus	330	Thallium	2
Boron	340	Holmium	0.8	Platinum	< 0.2	Thorium	14
Bromine	6	Indium	STD	Potassium	MC	Thulium	0.1
Cadmium	0.5	Iodine	2	Praseodymium	3	Tin	3
Calcium	MC	Iridium	< 0.2	Rhenium	< 0.2	Titanium	680
Cerium	19	Iron	MC	Rhodium	< 0.2	Tungsten	3
Cesium	4	Lanthanum	15	Rubidium	25	Uranium	11
Chlorine	160	Lead	21	Ruthenium	< 0.2	Vanadium	44
Chromium	37	Lithium	21	Samarium	8	Ytterbium	0.9
Cobalt	3	Lutetium	0.2	Scandium	6	Yttrium	21
Copper	49	Magnesium	MC	Selenium	14	Zinc	77
Dysprosium	1	Manganese	74	Silicon	MC	Zirconium	63
Erbium	0.6	Mercury	NR	Silver	0.2		
Europium	0.7	Molybdenum	16	Sodium	MC		

NR - Not Reported
MC - Major component

TABLE D38. SSMS DATA FOR SAMPLE FLY ASH 8-2

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈370	Neodymium	6	Strontium	MC
Antimony	5	Gadolinium	0.8	Nickel	13	Sulfur	MC
Arsenic	73	Gallium	17	Niobium	8	Tantalum	< 0.2
Barium	MC	Germanium	4	Osmium	< 0.2	Tellurium	≤ 0.3
Beryllium	2	Gold	< 0.2	Palladium	< 0.2	Terbium	0.3
Bismuth	0.5	Hafnium	2	Phosphorus	MC	Thallium	0.8
Boron	590	Holmium	0.5	Platinum	< 0.2	Thorium	9
Bromine	3	Indium	STD	Potassium	MC	Thulium	0.1
Cadmium	0.5	Iodine	0.7	Praseodymium	3	Tin	1
Calcium	MC	Iridium	< 0.2	Rhenium	< 0.2	Titanium	MC
Cerium	20	Iron	MC	Rhodium	< 0.2	Tungsten	3
Cesium	5	Lanthanum	16	Rubidium	14	Uranium	11
Chlorine	39	Lead	13	Ruthenium	< 0.2	Vanadium	53
Chromium	36	Lithium	49	Samarium	3	Ytterbium	0.9
Cobalt	3	Lutetium	0.2	Scandium	6	Yttrium	23
Copper	21	Magnesium	MC	Selenium	5	Zinc	26
Dysprosium	0.8	Manganese	80	Silicon	MC	Zirconium	81
Erbium	0.4	Mercury	NR	Silver	0.3		
Europium	0.4	Molybdenum	12	Sodium	MC		

MC - Major component
NR - Not Reported

TABLE D39. SSMS DATA FOR SAMPLE FLY ASH 1209-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈130	Neodymium	4	Strontium	MC
Antimony	5	Gadolinium	0.3	Nickel	8	Sulfur	MC
Arsenic	38	Gallium	8	Niobium	5	Tantalum	< 0.1
Barium	MC	Germanium	5	Osmium	< 0.1	Tellurium	≤ 0.3
Beryllium	0.3	Gold	< 0.1	Palladium	< 0.1	Terbium	0.1
Bismuth	0.3	Hafnium	< 0.1	Phosphorus	630	Thallium	0.4
Boron	87	Holmium	< 0.1	Platinum	< 0.1	Thorium	10
Bromine	6	Indium	STD	Potassium	MC	Thulium	< 0.1
Cadmium	0.2	Iodine	2	Praseodymium	2	Tin	2
Calcium	MC	Iridium	< 0.1	Rhenium	< 0.1	Titanium	480
Cerium	11	Iron	MC	Rhodium	< 0.1	Tungsten	0.9
Cesium	3	Lanthanum	10	Rubidium	11	Uranium	26
Chlorine	52	Lead	17	Ruthenium	< 0.1	Vanadium	14
Chromium	8	Lithium	9	Samarium	2	Ytterbium	< 0.1
Cobalt	1	Lutetium	< 0.1	Scandium	1	Yttrium	8
Copper	17	Magnesium	MC	Selenium	5	Zinc	24
Dysprosium	< 0.1	Manganese	47	Silicon	MC	Zirconium	26
Erbium	< 0.1	Mercury	NR	Silver	0.2		
Europium	0.2	Molybdenum	10	Sodium	MC		

NR- Not Reported
MC - Major component

TABLE D40. SSMS DATA FOR SAMPLE FLY ASH 0124-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈460	Neodymium	14	Strontium	MC
Antimony	10	Gadolinium	2	Nickel	13	Sulfur	MC
Arsenic	110	Gallium	34	Niobium	15	Tantalum	< 0.2
Barium	MC	Germanium	4	Osmium	< 0.2	Tellurium	0.4
Beryllium	1	Gold	< 0.2	Palladium	< 0.2	Terbium	0.6
Bismuth	0.4	Hafnium	0.8	Phosphorus	MC	Thallium	1
Boron	MC	Holmium	1	Platinum	< 0.2	Thorium	14
Bromine	9	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	0.8	Iodine	2	Praseodymium	7	Tin	3
Calcium	MC	Iridium	< 0.2	Rhenium	< 0.2	Titanium	MC
Cerium	30	Iron	MC	Rhodium	< 0.2	Tungsten	3
Cesium	4	Lanthanum	34	Rubidium	28	Uranium	18
Chlorine	160	Lead	59	Ruthenium	< 0.2	Vanadium	44
Chromium	30	Lithium	41	Samarium	7	Ytterbium	1
Cobalt	2	Lutetium	0.3	Scandium	8	Yttrium	19
Copper	70	Magnesium	MC	Selenium	11	Zinc	57
Dysprosium	2	Manganese	66	Silicon	MC	Zirconium	840
Erbium	0.8	Mercury	NR	Silver	0.5		
Europium	0.8	Molybdenum	19	Sodium	MC		

MC - Major component
NR - Not Reported

TABLE D41. SSMS DATA FOR SAMPLE FLY ASH 17-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈180	Neodymium	3	Strontium	MC
Antimony	2	Gadolinium	1	Nickel	3	Sulfur	MC
Arsenic	26	Gallium	13	Niobium	6	Tantalum	<0.2
Barium	MC	Germanium	3	Osmium	<0.2	Tellurium	<0.2
Beryllium	0.3	Gold	<0.2	Palladium	<0.2	Terbium	0.5
Bismuth	<0.2	Hafnium	<0.2	Phosphorus	270	Thallium	≤1
Boron	120	Holmium	≤1	Platinum	<0.2	Thorium	5
Bromine	5	Indium	STD	Potassium	MC	Thulium	<0.2
Cadmium	0.3	Iodine	0.6	Praseodymium	2	Tin	0.6
Calcium	MC	Iridium	<0.2	Rhenium	<0.2	Titanium	740
Cerium	12	Iron	MC	Rhodium	<0.2	Tungsten	1
Cesium	2	Lanthanum	13	Rubidium	11	Uranium	4
Chlorine	71	Lead	13	Ruthenium	<0.2	Vanadium	24
Chromium	12	Lithium	2	Samarium	3	Ytterbium	<0.2
Cobalt	3	Lutetium	<0.2	Scandium	2	Yttrium	11
Copper	9	Magnesium	MC	Selenium	4	Zinc	21
Dysprosium	2	Manganese	35	Silicon	MC	Zirconium	41
Erbium	0.4	Mercury	NR	Silver	0.2		
Europium	0.9	Molybdenum	6	Sodium	MC		

NR - Not Reported

MC - Major component

TABLE D42. SSMS DATA FOR SAMPLE FLY ASH 0116-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈490	Neodymium	4	Strontium	MC
Antimony	3	Gadolinium	1	Nickel	8	Sulfur	MC
Arsenic	73	Gallium	19	Niobium	7	Tantalum	<0.2
Barium	MC	Germanium	3	Osmium	<0.2	Tellurium	≤0.3
Beryllium	0.5	Gold	<0.2	Palladium	<0.2	Terbium	0.4
Bismuth	<0.2	Hafnium	<0.2	Phosphorus	MC	Thallium	1
Boron	180	Holmium	0.8	Platinum	<0.2	Thorium	12
Bromine	5	Indium	STD	Potassium	MC	Thulium	0.1
Cadmium	0.3	Iodine	2	Praseodymium	3	Tin	1
Calcium	MC	Iridium	<0.2	Rhenium	<0.2	Titanium	MC
Cerium	21	Iron	MC	Rhodium	<0.2	Tungsten	1
Cesium	4	Lanthanum	15	Rubidium	24	Uranium	14
Chlorine	63	Lead	26	Ruthenium	<0.2	Vanadium	47
Chromium	16	Lithium	5	Samarium	3	Ytterbium	<0.2
Cobalt	3	Lutetium	<0.2	Scandium	4	Yttrium	12
Copper	19	Magnesium	MC	Selenium	4	Zinc	21
Dysprosium	1	Manganese	160	Silicon	MC	Zirconium	73
Erbium	0.6	Mercury	NR	Silver	0.4		
Europium	0.5	Molybdenum	16	Sodium	MC		

NR - Not Reported
MC - Major Component

TABLE D43. SSMS DATA FOR SAMPLE FLY ASH 1005-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈ 530	Neodymium	8	Strontium	MC
Antimony	9	Gadolinium	2	Nickel	6	Sulfur	MC
Arsenic	79	Gallium	20	Niobium	10	Tantalum	< 0.2
Barium	MC	Germanium	3	Osmium	< 0.2	Tellurium	≤ 0.5
Beryllium	2	Gold	< 0.2	Palladium	< 0.2	Terbium	0.7
Bismuth	0.5	Hafnium	2	Phosphorus	MC	Thallium	≤ 0.7
Boron	360	Holmium	1	Platinum	< 0.2	Thorium	26
Bromine	6	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	0.7	Iodine	2	Praseodymium	4	Tin	1
Calcium	MC	Iridium	< 0.2	Rhenium	< 0.2	Titanium	MC
Cerium	35	Iron	MC	Rhodium	< 0.2	Tungsten	7
Cesium	5	Lanthanum	35	Rubidium	33	Uranium	36
Chlorine	210	Lead	37	Ruthenium	< 0.2	Vanadium	57
Chromium	43	Lithium	14	Samarium	6	Ytterbium	1
Cobalt	4	Lutetium	0.3	Scandium	9	Yttrium	12
Copper	82	Magnesium	MC	Selenium	8	Zinc	80
Dysprosium	2	Manganese	510	Silicon	MC	Zirconium	39
Erbium	0.6	Mercury	NR	Silver	0.3		
Europium	0.7	Molybdenum	14	Sodium	MC		

MC - Major component
NR - Not Reported

TABLE D44. DATA FOR LELAND OLDS FLY ASH POND WATER

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.5	Fluorine	MC	Neodymium	<0.001	Strontium	MC
Antimony	0.06	Gadolinium	<0.001	Nickel	0.03	Sulfur	MC
Arsenic	0.08	Gallium	0.005	Niobium	0.002	Tantalum	<0.001
Barium	0.5	Germanium	0.01	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.004	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	4	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.02	Praseodymium	<0.001	Tin	*0.04
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	*0.2
Cerium	0.003	Iron	1	Rhodium	<0.001	Tungsten	0.01
Cesium	0.01	Lanthanum	0.004	Rubidium	0.07	Uranium	<0.001
Chlorine	MC	Lead	0.01	Ruthenium	<0.001	Vanadium	0.06
Chromium	0.01	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.06	Lutetium	<0.001	Scandium	≤0.002	Yttrium	0.006
Copper	0.03	Magnesium	9	Selenium	0.2	Zinc	0.3
Dysprosium	<0.001	Manganese	0.02	Silicon	MC	Zirconium	0.008
Erbium	<0.001	Mercury	NR	Silver	*0.008		
Europium	<0.001	Molybdenum	0.8	Sodium	>5		

NR - Not Reported

MC - Major Component

*Heterogeneous

TABLE D45. E.H. RICHARDSON 021701 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	3900
0.15	1,2-dichloroethylene (cis and trans)	<1
0.40	chloroform	21
1.00	1,2-DIBROMOETHANE	IS
2.36	dichlorobenzene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE D46. E.H. RICHARDSON 021702 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	~9000
0.39	chloroform	28
0.87	trichloroethylene	<1
0.92	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS
1.56	toluene	12

*Relative to the internal standard 1,2-dibromoethane.

TABLE D47. E.H. RICHARDSON 021712A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	74
0.40	chloroform	30
0.92	benzene	4.6
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D48. E.H. RICHARDSON 021713A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	50
0.92	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS
1.13	bromoform	5

*Relative to the internal standard 1,2-dibromoethane.

TABLE D49. E.H. RICHARDSON 021713B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	79
0.48	methylene bromide	AS
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.11	bromoform	21

*Relative to the internal standard 1,2-dibromoethane.

TABLE D50. E.H. RICHARDSON 021705 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	∿9000
0.57	chloroform	3
0.92	benzene	1
1.00	1,2-DIBROMOETHANE	IS
2.39	unknown	

*Relative to the internal standard 1,2-dibromoethane.

TABLE D51. E.H. RICHARDSON 021706 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	∿9000
0.39	chloroform	2
0.58	unknown	
1.00	1,2-DIBROMOETHANE	IS
1.11	bromoform	580

*Relative to the internal standard 1,2-dibromoethane.

TABLE D52. E.H. RICHARDSON 021708A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	9400
0.39	chloroform	44
0.92	benzene	1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D53. E.H. RICHARDSON 021711C VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	∿9400
0.39	chloroform	∿100
0.86	trichloroethylene	1
0.92	benzene	6
1.00	1,2-DIBROMOETHANE	IS
1.12	bromoform	6
1.40	1,1,2,2-tetrachloroethane	2
1.84	unknown	
2.16	unknown	
2.20	o-xylene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE D54. E.H. RICHARDSON 021714A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	∿9400
0.93	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D55. E.H. RICHARDSON 021715B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	∿9400
0.37	1,2-dichloroethylene (cis and trans)	25
0.94	benzene	<1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D56. E.H. RICHARDSON 021718 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	∿3900
0.26	unknown	
0.39	chloroform	17
0.42	1,2-dichloroethylene (cis and trans)	53
0.93	benzene	1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D57. E.H. RICHARDSON 021720 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	∿9000
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D58. E.H. RICHARDSON 021723 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	∿2000
0.28	trichlorofluoromethane	NQ
0.33	unknown	
0.38	1,1-dichloroethane	16
0.43	1,2-dichloroethylene (cis and trans)	11
0.67	chloroform	20
0.82	bromodichloromethane	4
0.89	chlorodibromomethane	<1
0.93	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS
1.06	n-hexane	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE D59. E.H. RICHARDSON 021725A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.16	methylene chloride	∿2000
0.38	1,2-dichloroethylene (cis and trans)	2
0.40	chloroform	2
0.54	1,1,1-trichloroethane	12
0.92	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS
1.43	1,1,2,2-tetrachloroethene	78
1.58	toluene	1
2.22	o-xylene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE D60. E.H. RICHARDSON 021726B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	∿2000
0.22	1,2-dichloroethylene (cis and trans)	<1
0.23	trichlorofluoromethane	NQ
0.38	chloroform	6
0.92	benzene	46
1.00	1,2-DIBROMOETHANE	IS
1.06	n-hexane	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE D61. E.H. RICHARDSON 021726C VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	∿2000
0.22	trichlorofluoromethane	*NQ
0.22	1,2-dichloroethylene (cis and trans)	<1
0.39	chloroform	6
0.92	benzene	45
1.00	1,2-DIBROMOETHANE	IS
1.05	n-hexane	NQ

*Relative to the internal standard 1,2-dibromoethane.
*Due to masking by methylene chloride.

TABLE D62. E.H. RICHARDSON 021727A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	methylene chloride	2000
0.45	chloroform	1
0.93	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D63. E.H. RICHARDSON 021731A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	480
0.19	carbon disulfide	<1
0.39	chloroform	13
0.63	unknown	
0.64	bromodichloromethane	<1
0.93	benzene	
1.00	1,2-DIBROMOETHANE	IS
1.08	n-hexane	NQ
1.52	toluene	<1
1.87	ethylbenzene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE D64. E.H. RICHARDSON 021732B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	48
0.40	chloroform	2
0.93	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D65. E.H. RICHARDSON 021733A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	750
0.40	chloroform	1
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.14	noise spike	

*Relative to the internal standard 1,2-dibromoethane.

TABLE D66. E.H. RICHARDSON 021734B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	~9000
0.39	chloroform	1
0.58	unknown	
0.87	unknown	
0.92	benzene	4
1.00	1,2-DIBROMOETHANE	IS
1.55	toluene	<1
1.72	unknown (tentative)	
1.76	isocamphene	NQ
1.79	pinane	NQ
1.86	ethylbenzene	1
2.18	o-xylene	4
2.23	n-propylbenzene	5
2.35	1-phenyl-2-methyl-prop-1-ene	NQ
2.49	1-n-butyl-cyclohexene-1	NQ
2.57	isobutylcyclohexane	NQ
2.62	n-dodecane	NQ
2.70	unknown	
2.78	unknown alkane	NQ
2.85	ar-tert-butyl-ar-chlorobenzene	NQ
2.87	unknown	

*Relative to the internal standard 1,2-dibromoethane.

TABLE D67. E.H. RICHARDSON 021735A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	~1800
0.40	chloroform	2
0.93	benzene	<1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D68. E.R. RICHARDSON 021736 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	1800
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D69. E.H. RICHARDSON 021739A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	140
0.16	dimethylamine (tentative)	NQ
0.40	chloroform	1
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.05	n-hexane	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE D70. E.H. RICHARDSON 021744D VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	300
0.40	chloroform	1
0.53	1,1,1-trichloroethane	27
0.93	benzene	2
1.00	1,2-DIBROMOETHANE	IS
1.04	n-hexane	NQ

*Relative to the internal standard 1,2-dibromoethane.

TABLE D71. E.H. RICHARDSON 021755A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	~1800
0.40	chloroform	<1
0.57	n-pentane (tentative)	NQ
0.93	benzene	<1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D72. E.H. RICHARDSON 021745A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	2100
0.39	chloroform	10
0.57	butane (tentative)	NQ
0.64	bromodichloromethane	1
0.93	benzene	1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D73. E.H. RICHARDSON 021745B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	740
0.40	chloroform	41
0.62	bromodichloromethane	3
0.86	dibromochloromethane	<1
0.93	benzene	<1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D74. E.H. RICHARDSON 021747 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
	methylene chloride	>3900
0.21	trichlorofluoromethane	NQ
0.39	chloroform	4
0.46	1,2-dichloroethane	44
0.61	bromodichloromethane	<1
0.78	trichloroethylene	<1
0.87	dibromochloromethane	5
0.91	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.09	bromoform	97
1.40	tetrachloroethylene	5
1.55	toluene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE D75. E.H. RICHARDSON 021478 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	240
0.39	chloroform	3
0.47	1,2-dichloroethane	72
0.58	thiophene	<1
0.82	trichloroethylene	<1
0.93	benzene	1
1.00	1,2-DIBROMOETHANE	IS
1.45	1,1,2,2-tetrachloroethene	4

*Relative to the internal standard 1,2-dibromoethane.

TABLE D76. E.H. RICHARDSON 021749E VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	∿1800
0.39	chloroform	3
0.92	benzene	blank contaminant
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-dibromoethane.

TABLE D77. LELAND OLDS FLY ASH VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
27*	ethanol	>100000
37	methylene chloride	750
49	acetone	blank contaminant
58	isopropyl alcohol	blank contaminant
70	chlorobromomethane (tentative)	NQ
94	tert-butyl alcohol	83
104	chloroform	110
113	ethyl ether	550
165	n-butyl alcohol	4900
181	3,3-dimethylcyclobutanecarbonitrile (tentative)	NQ
206	tricholorethylene	4
219	benzene	280
250	hexane	blank contaminant
263	methylcyclohexane	81
278	ethylcyclopentane	16
283	2,3-dimethylpentane	500
291	di-isoamylcarbonate (tentative)	NQ
313	3-methylhexane	1200
326	1,1,2,2-tetrachloroethene	19
355	toluene	blank contaminant
369	C_8H_{18} isomer (tentative)	NQ
408	C_8H_{18} isomer (tentative)	NQ
416	ethylbenzene	blank contaminant
448	isopropylbenzene	7.7
454	3,5,5-trimethyl-1-hexene (tentative)	NQ
474	m- and/or p-xylene	13
484	o-xylene	14
498	phenylacetaldehyde	>100000

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D78. MILTON YOUNG FLY ASH VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
30*	methanol	>100000
52	ethanol	85000
64	methylene chloride	4000
71	acetone	blank contaminant
82	trichlorofluoromethane	blank contaminant
106	isobutyraldehyde (tentative)	NQ
115	chloroform	1200
125	methyl isopropyl ether (tentative)	NQ
134	methyl ethyl ketone	blank contaminant
151	3-methyl-2-butanone	17000
162	ethyl acetate	>57000
177	methylpyrazole isomer (tentative)	NQ
185	unknown	
194	$C_5H_{10}O$ aldehyde	~1300
222	benzene	blank contaminant
242	~cyalkane (tentative)	NQ
259	cyclohexanone	59000
262	C_7H_{16} isomer	~1500
279	dimethyltetrahydrofuran isomer	blank contaminant
291	C_7H_{12} isomer (tentative)	NQ
305	3-hexanone	2200
313	2-hexanone	17000
318	n-hexanal	5800
341	unknown	
352	toluene	blank contaminant
404	2-heptanone	340
420	piperitone (tentative)	NQ
420	ethylbenzene	blank contaminant
438	benzaldehyde	blank contaminant
458	styrene	41
463	methyl heptanone isomer	220
471	o-xylene	blank contaminant
489	octanone isomer	~3100
496	benzofuran	110
516	C_9H_{12} isomer + unknown	~74

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D79. BIG STONE FLY ASH VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
45*	methylene chloride	60000
67	trichlorofluoromethane	110
106	chloroform	140
114	ethyl ether	250
140	1,1,1-trichloroethane	10
169	C_6H_{12} isomer	∿360
220	benzene	blank contaminant
251	hexane	blank contaminant
350	toluene	blank contaminant

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D80. HOOT LAKE FLY ASH VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
33*	ethanol	58000
45	methylene chloride	5100
54	acetone	blank contaminant
59	isopropyl alcohol	10000
70	trichlorofluoromethane	blank contaminant
74	unknown	
110	chloroform	720
115	ethyl ether	1300
220	benzene	210
251	n-hexane	blank contaminant
356	toluene	blank contaminant

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D81. UPA FLY ASH VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
31*	ethanol	56000
40	methylene chloride	59
51	acetone	blank contaminant
57	isopropanol	blank contaminant
105	chloroform	2
215	benzene	blank contaminant
350	toluene	blank contaminant
415	ethylbenzene	6

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D82. FLY ASH 0120-1 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
27*	ethanol (tentative)	NQ
35	methylene chloride	blank contaminant
47	acetone	blank contaminant
58	isopropyl alcohol	blank contaminant
95	unknown	
104	chloroform	18
113	methyl isopropyl ether (tentative)	NQ
125	methyl ethyl ketone (tentative)	NQ
168	1-butanol (tentative)	NQ
222	benzene	blank contaminant
254	n-hexane	blank contaminant
360	toluene	blank contaminant
408	unknown	
420	ethylbenzene	blank contaminant
454	benzaldehyde (tentative)	NQ

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D83. FLY ASH 10-3 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
12*	methanol	>100000
45	methylene chloride	1800
52	acetone	blank contaminant
105	chloroform	200
114	ethyl ether	540
140	1,1,1-trichloroethane	16
210	trichloroethylene	11
220	benzene	65
250	hexane	blank contaminant
330	1,1,2,2-tetrachloroethene	5
350	toluene	54
420	ethylbenzene	3
521	unknown	

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D84. FLY ASH 8-2 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
36*	methylene chloride	31000
49	acetone	blank contaminant
64	trichlorofluoromethane	4900
106	chloroform	780
114	methyl isopropyl ether (tentative)	NQ
224	benzene	blank contaminant
254	n-hexane	blank contaminant
360	toluene	blank contaminant
419	tetramethylpentane isomer (tentative)	NQ
466	propyltridecane isomer (tentative)	NQ
507	trimethylheptane isomer (tentative)	NQ
554	tetramethylpentane isomer (tentative)	NQ

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D85. FLY ASH 1209-1 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
26*	ethanol	>100000
36	methylene chloride	5700
48	acetone	blank contaminant
105	chloroform	610
115	methyl isopropyl ether (tentative)	NQ
125	methyl ethyl ketone	840
168	1-butanol	54000
210	trichloroethylene	30
220	benzene	1100
254	n-hexane	blank contaminant
331	1,1,2,2-tetrachloroethene	340
360	toluene	250
422	ethylbenzene	120

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D86. FLY ASH 0124-1 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
7*	methanol	>100000
28	ethanol	>100000
37	methylene chloride	1200
50	acetone	blank contaminant
94	tert-butyl alcohol	2300
105	chloroform	230
115	methyl isopropyl ether (tentative)	NQ
125	methyl ethyl ketone	610
168	n-butanol	20000
210	trichloroethylene	27
224	benzene	500
254	n-hexane	blank contaminant
315	noise spike	
337	1,1,2,2-tetrachloroethene	60
356	toluene	240
422	ethylbenzene	150
453	isopropylbenzene	29
481	o-xylene	57
490	m- and/or p-xylene	48

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D87. FLY ASH 17-1 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
35*	methylene chloride	4400
48	acetone	blank contaminant
63	trichlorofluoromethane	29
96	tert-butyl alcohol	3300
105	chloroform	510
114	methyl isopropyl ether (tentative)	NQ
126	methyl ethyl ketone	3800
170	n-butanol	6200
210	trichloroethylene	28
224	benzene	420
254	n-hexane	blank contaminant
330	1,1,2,2-tetrachloroethene	120
360	toluene	220
422	ethylbenzene	75
454	isopropyl benzene	35
481	o-xylene	33
490	m- and/or p-xylene	32
590	dimethylundecane isomer (tentative)	NQ

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F88. FLY ASH 0116-1 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ng/g)
40*	methylene chloride	19000
51	acetone	blank contaminant
65	trichlorofluoromethane	480
105	chloroform	320
116	methyl isopropyl ether (tentative)	NQ
225	benzene	blank contaminant

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D89. FLY ASH 1005-1 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
40*	methylene chloride	24000
65	trichlorofluoromethane	230
105	chloroform	250
114	methyl isopropyl ether (tentative)	NQ
192	noise spike	
225	benzene	blank contaminant

*Because of the nature of the trapping procedure, an internal standard was not added to this sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE D90. LELAND OLDS FLY ASH POND WATER VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	methylene chloride	52
0.95	benzene	2
1.00	1,2-DIBROMOETHANE	IS
1.49	toluene	7
1.63	chlorobenzene	<1

*Relative to the internal standard 1,2-dibromoethane.

TABLE D91. E.H. RICHARDSON 021701 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.37	2,6-di-tert-butyl-4-methyl phenol	∿82
1.47	unknown	
1.54	2,4-dichlorophenol	7
1.77	unknown	
1.86	unknown	
1.86	octadecane	45
1.93	unknown	
1.97	D-10 ANTHRACENE	IS
2.06	tricosane	35
2.09	di-n-butyl phthalate	270
2.15	tetracosane	38
2.25	pentacosane	33
2.34	column/septum bleed	
2.44	unknown	
2.56	bis-(2-ethylhexyl)phthalate	<1

*Relative to the internal standard D-4 dibromobenzene.

TABLE D92. E.H. RICHARDSON 021701 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.24	column/septum bleed	
1.50	column/septum bleed	
1.73	diethyl phthalate	11
1.74	column/septum bleed	
1.95	D-10 ANTHRACENE	IS
2.07	di-n-butyl phthalate	9
2.15	column/septum bleed	
2.33	column/septum bleed	
2.50	column/septum bleed	
2.58	bis-(2-ethylhexyl)phthalate	2
2.61	di-n-octyl phthalate	3
2.66	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D93. E.H. RICHARDSON 021702 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.74	diethyl phthalate	1
1.85	unknown	
1.96	D-10 ANTHRACENE	IS
2.07	di-n-butyl phthalate	27
2.15	column/septum bleed	
2.20	column/septum bleed	
2.23	column/septum bleed	
2.28	column/septum bleed	
2.31	column/septum bleed	
2.33	column/septum bleed	
2.50	column/septum bleed	
2.61	column/septum bleed	
2.67	column/septum bleed	
2.83	column/septum bleed	
3.14	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D94. E.H. RICHARDSON 021702 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.24	unknown	
1.50	column/septum bleed	
1.73	diethylphthalate	<1
1.74	column/septum bleed	
1.95	D-10 ANTHRACENE	IS
2.04	tricosane	12
2.07	di-n-butyl phthalate	190
2.13	tetracosane	13
2.22	pentacosane	11
2.32	hexacosane	<1
2.41	heptacosane	AS
2.50	column/septum bleed	
2.56	bis-(2-ethylhexyl)phthalate	4
2.59	di-n-octyl phthalate	8
2.69	$C_{15}H_{12}O_3$ isomer (tentative)	NQ
2.82	unknown phthalate	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D95. E.H. RICHARDSON 021703A

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.73	column/septum bleed	
1.95	D-10 ANTHRACENE	IS
2.04	tricosane	1
2.07	di-n-butyl phthalate	36
2.13	tetracosane	<1
2.15	column/septum bleed	
2.24	pentacosane	5
2.27	column/septum bleed	
2.32	column/septum bleed	
2.41	heptacosane	∿2
2.50	column/septum bleed	
2.66	bis-(2-ethylhexyl) phthalate	<1
2.84	column/septum bleed	
2.94	column/septum bleed	
3.04	column/septum bleed	
3.13	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D96. E.H. RICHARDSON 021703 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.25	column/septum bleed	
1.41	column/septum bleed	
1.64	unknown	
1.73	diethyl phthalate	<1
1.75	column/septum bleed	
1.95	D-10 ANTHRACENE	IS
2.06	di-n-butyl phthalate	14
2.14	colymn/septum bleed	
2.32	column/septum bleed	
2.49	column/septum bleed	
2.55	bis-(2-ethylhexyl)phthalate	
2.59	di-n-octyl phthalate	10
2.67	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D97. E.H. RICHARDSON 021712 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tnetative)	NQ
1.65	tributyl phosphate	~26
1.98	D-10 ANTHRACENE	IS
2.08	tricosane	1
2.10	di-n-butyl phthalate	28
2.19	column/septum bleed	
2.27	pentacosane	2
2.38	column/septum bleed	
2.55	column/septum bleed	
2.57	bis-(2-ethylhexyl)phthalate	18
2.66	di-n-octyl phthalate	17

*Relative to the internal standard D-4 dibromobenzene.

TABLE D98. E.H. RICHARDSON 021712 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
	+ naphthalene	<1
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.55	column/septum bleed	
1.77	diethyl phthalate	3
1.78	column/septum bleed	
1.87	eicosane	10
2.01	D-10 ANTHRACENE	IS
2.08	tricosane	17
2.13	di-n-butyl phthalate	6
2.19	tetracosane	19
2.20	column/septum bleed	
2.29	pentacosane	23
2.38	hexacosane	13
2.48	unknown	
2.57	column/septum bleed	
2.62	bis-(2-ethylhexyl)phthalate	3
2.68	di-n-octyl phthalate	3

*Relative to the internal standard D-4 dibromobenzene.

TABLE D99. E.H. RICHARDSON 021713 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer	NQ
1.76	column/septum bleed	
1.97	column/septum bleed	
2.08	di-n-butyl phthalate	<1
2.16	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D100. E.H. RICHARDSON 021713 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.31	unknown	
1.48	unknown	
1.55	column/septum bleed	
1.77	diethyl phthalate	1
1.80	column/septum bleed	
2.01	D-10 ANTHRACENE	IS
2.09	tricosane	17
2.13	di-n-butyl phthalate	5
2.31	column/septum bleed	
2.30	hexacosane + column/septum bleed	<1
2.39	column/septum bleed	
2.48	unknown	
2.56	column/septum bleed	
2.61	bis-(2-ethylhexyl)phthalate	3
2.68	di-n-octyl phthalate	3

*Relative to the internal standard D-4 dibromobenzene.

TABLE D101. E.H. RICHARDSON 021705 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.26	adenine (tentative)	NQ
1.52	2,4-dichlorophenol	22
1.73	diethyl phthalate	16
1.78	unknown	
1.85	docosane	2
1.95	D-10 ANTHRACENE	IS
1.98	methyl-n-pentadecanoate (tentative)	NQ
2.04	tricosane	4
2.07	di-n-butyl phthalate	24
2.13	tetracosane	2
2.23	pentacosane	8
2.27	unknown	
2.32	hexacosane	11
2.41	heptacosane	∿4
2.50	column/septum bleed	
2.54	bis-(2-ethylhexyl)phthalate	3
2.60	di-n-octyl phthalate	4
2.66	column/septum bleed	
2.84	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D102. E.H. RICHARDSON 021705 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.48	1,3-dichlorobenzene	13
0.59	column/septum bleed	
0.81	isophorone + unknown	∿5
1.00	D-4 DIBROMOBENZENE	IS
1.25	unknown	
1.34	unknown	
1.36	unknown	
1.53	column/septum bleed	
1.65	dimethyl phthalate + unknown	1
1.76	diethyl phthalate + unknown	3
1.97	D-10 ANTHARCENE	IS
2.09	di-n-butyl phthalate	340
2.18	column/septum bleed	
2.23	column/septum bleed	
2.26	column/septum bleed	
2.33	caffeine + unknown	∿170
2.53	column/septum bleed	
2.60	bis-(2-ethylhexyl)phthalate	2
2.64	di-n-octyl phthalate	2

*Relative to the internal standard D-4 dibromobenzene.

TABLE D103. E.H. RICHARDSON 021706 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOETHANE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.28	unknown	
1.63	$C_{12}H_{27}O_4P$ isomer (tentative)	NQ
1.74	column/septum bleed	
1.95	D-10 ANTHRACENE	IS
2.07	di-n-butyl phthalate	14
2.15	tetracosane	2
2.32	column/septum bleed	
2.50	column/septum bleed	
2.57	bis-(2-ethylhexyl)phthalate	1
2.60	di-n-octyl phthalate	6
2.65	column/septum bleed	
2.77	column/septum bleed	
3.14	column/septum bleed	

*Relative to the internal standard D-4 dibromoethane.

TABLE D104. E.H. RICHARDSON 021706 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.46	bromoform (tentative)	NQ
0.81	unknown	
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.31	unknown	
1.54	column/septum bleed	
1.76	diethyl phthalate	11
1.98	D-10 ANTHRACENE	IS
2.11	di-n-butyl phthalate	9
2.19	column/septum bleed	
2.38	column/septum bleed	
2.55	$C_{12}H_{11}NO_5$ isomer (tentative)	NQ
2.60	bis-(2-ethylhexyl)phthalate	2
2.64	di-n-octyl phthalate	3

*Relative to the internal standard D-4 dibromobenzene.

TABLE D105. E.H. RICHARDSON 021708 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.65	1,3 - dichlorobenzene	9
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16})_2$ isomer (tentative)	NQ
1.65	tributyl phosphate	∿2
1.73	diethyl phthalate	<1
1.97	column/septum bleed	
2.08	di-n-butyl phthalate	5
2.16	column/septum bleed	
2.36	column/septum bleed	
2.45	column/septum bleed	
2.57	bis-(2-ethylhexyl)phthalate	12
2.63	di-n-octyl phthalate	6
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D106. E.H. RICHARDSON 021708 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.94	unknown	
1.00	D-4 DIBROMOBENZENE	IS
1.05	naphthalene	<1
1.17	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.25	column/septum bleed	
1.29	unknown	
1.51	column/septum bleed	
1.76	diethyl phthalate	1
1.77	column/septum bleed	
1.85	unknown	
1.92	unknown	
1.96	D-10 ANTHRACENE	IS
2.02	unknown	
2.08	di-n-butyl phthalate	26
2.17	column/septum bleed	
2.35	column/septum bleed	
2.52	column/septum bleed	
2.56	bis-(2-ethylhexyl)phthalate	12
2.68	column/septum bleed	
2.86	column/septum bleed	
3.16	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D107. E.H. RICHARDSON 021711 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.65	unknown	
1.69	tributyl phosphate	<1
1.75	diethyl phthalate	2
1.97	D-10 ANTHRACENE	IS
1.99	octasulfur (tentative)	NQ
2.05	tricosane	<1
2.08	di-n-butyl phthalate	26
2.16	unknown	
2.25	pentacosane	1
2.34	column/septum bleed	
2.55	bis-(2-ethylhexyl) phthalate	23
2.61	di-n-octyl phthalate	24

*Relative to the internal standard D-4 dibromobenzene.

TABLE D108. E.H. RICHARDSON 021711 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.83	isophorone	4
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.52	column/septum bleed	
1.73	unknown	
1.74	diethyl phthalate + Column/septum bleed	<1
1.98	D-10 ANTHRACENE	IS
2.09	di-n-butyl phthalate	16
2.27	column/septum bleed	
2.46	column/septum bleed	
2.59	bis-(2-ethylhexyl)phthalate	12
2.64	di-n-octyl phthalate	20

*Relative to the internal standard D-4 dibromobenzene.

TABLE D109. E.H. RICHARDSON 021714 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.99	column/septum bleed	
2.11	di-n-butyl phthalate	3
2.19	column/septum bleed	
2.38	column/septum bleed	
2.55	column/septum bleed	
2.59	bis-(2-ethylhexyl) phthalate	12
2.64	di-n-octyl phthalate	3
2.71	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D110. E.H. RICHARDSON 021714 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.17	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.52	column/septum bleed	
1.75	diethyl phthalate	1
1.77	column/septum bleed	
1.99	D-10 ANTHRACENE	IS
2.10	di-n-butyl phthalate	10
2.17	tetracosane	3
2.19	column/septum bleed	
2.26	pentacosane	3
2.37	column/septum bleed	
2.55	column/septum bleed	
2.59	bis-(2-ethylhexyl)phthalate	10
2.65	di-n-octyl phthalate	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D111. E.H. RICHARDSON 021715 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.65	tributyl phosphate	∿1
1.98	D-10 ANTHRACENE	IS
2.10	di-n-butyl phthalate	11
2.19	column/septum bleed	
2.38	column/septum bleed	
2.44	unknown	
2.55	$C_{12}H_{11}NO_5$ isomer (tentative)	NQ
2.60	bis-(2-ethylhexyl) phthalate	19
2.65	di-n-octyl phthalate	8
2.89	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D112. E.H. RICHARDSON 021715 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.75	diethyl phthalate	1
1.77	column/septum bleed	
1.99	D-10 ANTHRACENE +	IS
	phenanthrene/anthracene	<1
2.11	di-n-butyl phthalate	18
2.44	unknown	
2.55	unknown	
2.60	bis-(2-ethylhexyl)phthalate	145

*Relative to the internal standard D-4 dibromobenzene.

TABLE D113. E.H. RICHARDSON 021718 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.97	column/septum bleed	
2.08	di-n-butyl phthalate	1
2.17	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.68	column/septum bleed	
2.72	unknown	
2.86	unknown	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D114. E.H. RICHARDSON 021718 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.77	column/septum bleed	
1.00	D-4 DIBROMOBENZENE	IS
1.52	column/septum bleed	
1.75	diethyl phthalate	<1
1.85	column/septum bleed	
2.00	D-10 ANTHRACENE	IS
2.06	tricosane	<1
2.09	di-n-butyl phthalate	6
2.17	column/septum bleed	
2.26	pentacosane	2
2.36	column/septum bleed	
2.54	column/septum bleed	
2.58	bis-(2-ethylhexyl)phthalate	
2.64	di-n-octyl phthalate	12
2.69	column/septum bleed	
2.87	column/septum bleed	
2.97	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D115. E.H. RICHARDSON 021720 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$D_7H_{16}O_2$ isomer (tentative)	NQ
1.74	diethyl phthalate	<1
1.75	column/septum bleed	
1.99	D-10 ANTHRACENE	IS
2.01	octasulfur (tentative)	NQ
2.09	di-n-butyl phthalate	6
2.17	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.58	bis-(2-ethylhexyl) phthalate	17
2.65	di-n-octyl phthalate	17
2.68	column/septum bleed	
2.87	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D116. E.H. RICHARDSON 021720 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.71	solvent bleed	
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.29	unknown	
1.74	diethyl phthalate	1
1.76	column/septum bleed	
1.85	unknown	
1.94	unknown	
1.97	D-10 ANTHRACENE	IS
2.05	di-n-butyl phthalate	2
2.09	unknown	
2.16	column/septum bleed	
2.21	unknown	
2.25	pentacosane	1
2.35	column/septum bleed	
2.45	column/septum bleed	
2.52	column/septum bleed	
2.56	bis-(2-ethylhexyl)phthalate	4
2.68	column/septum bleed	
2.87	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D117. E.H. RICHARDSON 021723 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{12}O_2$ isomer (tentative)	NQ
1.75	column/septum bleed	
1.98	column/septum bleed	
2.08	di-n-butyl phthalate	1
2.17	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	7
2.62	di-n-octyl phthalate	7
2.68	column/septum bleed	
2.87	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D118. E.H. RICHARDSON 021723 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.30	unknown	
1.73	diethyl phthalate	<1
1.75	column/septum bleed	
1.98	D-10 ANTHRACENE	IS
2.09	di-n-butyl phthalate	3
2.17	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.56	bis-(2-ethylhexyl)phthalate	5
2.68	column/septum bleed	
2.86	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D119. E.H. RICHARDSON 021725 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.97	column/septum bleed	
2.06	di-n-butyl phthalate	1
2.17	column/septum bleed	
2.35	column/septum bleed	
2.46	unknown	
2.53	column/septum bleed	
2.57	bis-(2-ethylhexyl) phthalate	7
2.68	column/septum bleed	
2.72	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D120. E.H. RICHARDSON 021725 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.56	1,4-dichlorobenzene	<1
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.75	diethyl phthalate	<1
1.77	column/septum bleed	
1.92	unknown phthalate (tentative)	NQ
1.97	phenanthrene/anthracene	<1
1.99	D-10 ANTHRACENE	IS
2.12	di-n-butyl phthalate	1
2.19	column/septum bleed	
2.38	column/septum bleed	
2.48	heptacosane +	∿3
	unknown phthalate (tentative)	NQ
2.55	column/septum bleed	
2.59	bis-(2-ethylhexyl)phthalate	18
2.70	column/septum bleed	
2.89	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D121. E.H. RICHARDSON 021727 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.96	column/septum bleed	
2.07	di-n-butyl phthalate	9
2.16	column/septum bleed	
2.24	unknown	
2.34	column/septum bleed	
2.42	column/septum bleed	
2.51	column/septum bleed	
2.57	bis-(2-ethylhexyl)phthalate	24
2.63	column/septum bleed	
2.83	column/septum bleed	
3.14	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D122. E.H. RICHARDSON 021727 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.20	unknown	
1.28	adenine (tentative)	NQ
1.78	diethyl phthalate	4
1.80	column/septum bleed	
1.90	column/septum bleed	
2.01	D-10 ANTHRACENE	IS
2.06	methyl-n-pentadecanoate (tentative)	NQ
2.10	tricosane	63
2.15	di-n-butyl phthalate	3
2.19	tetracosane	70
2.21	column/septum bleed	
2.23	unknown	
2.31	pentacosane	79
2.34	unknown	
2.39	unknown	
2.45	dimethyl naphthalate (tentative)	NQ
2.48	unknown	
2.58	column/septum bleed	
2.63	bis-(2-ethylhexyl)phthalate	25
2.74	column/septum bleed	
2.95	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D123. E.H. RICHARDSON 021731 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.73	benzyl chloride	∿4
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.26	adenine (tentative)	NQ
1.57	unknown	
1.75	diethyl phthalate	<1
1.96	unknown	
2.09	di-n-butyl phthalate	2
2.17	unknown	
2.36	unknown	
2.56	bis-(2-ethylhexyl) phthalate	17

*Relative to the internal standard D-4 dibromobenzene.

TABLE D124. E.H. RICHARDSON 021731 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.73	unknown	
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.29	unknown	
1.35	unknown	
1.44	triisobutyltin chloride	∿62
1.57	unknown	
1.73	diethyl phthalate	<1
1.75	column/septum bleed	
1.77	unknown	
1.98	D-10 ANTHRACENE	IS
2.11	di-n-butyl phthalate	3
2.17	unknown	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.56	bis-(2-ethylhexyl)phthalate	19
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D125. E.H. RICHARDSON 021732 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.24	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.73	diethyl phthalate	<1
1.94	D-10 ANTHRACENE	IS
2.03	tricosane	<1
2.06	di-n-butyl phthalate	13
2.13	tetracosane	<1
2.19	column/septum bleed	
2.21	pentacosane	3
2.25	column/septum bleed	
2.31	column/septum bleed	
2.40	unknown	
2.48	column/septum bleed	
2.52	bis-(2-ethylhexyl)phthalate	18
2.58	di-n-octyl phthalate	18
2.63	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D126. E.H. RICHARDSON 021732 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.19	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.74	diethyl phthalate	<1
1.77	column/septum bleed	
1.99	D-10 ANTHRACENE	IS
2.07	di-n-butyl phthalate	2
2.11	unknown	
2.19	column/septum bleed	
2.28	pentacosane	
2.34	column/septum bleed	
2.46	heptacosane + column/septum bleed	<1
2.55	column/septum bleed	
2.59	bis-(2-ethylhexyl) phthalate	3
2.71	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D127. E.H. RICHARDSON 021733 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.97	D-10 ANTHRACENE	IS
2.08	di-n-butyl phthalate	19
2.17	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	17
2.63	di-n-octyl phthalate	17
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D128. E.H. RICHARDSON 021733 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.21	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.79	column/septum bleed	
2.03	D-10 ANTHRACENE	IS
2.15	di-n-butyl phthalate	8
2.23	column/septum bleed	
2.42	column/septum bleed	
2.60	column/septum bleed	
2.64	bis-(2-ethylhexyl) phthalate	7
2.76	column/septum bleed	
2.94	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D129. E.H. RICHARDSON 021734 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.75	diethyl phthalate	<1
1.97	D-10 ANTHRACENE	IS
2.09	di-n-butyl phthalate	18
2.17	column/septum bleed	
2.25	unknown	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	18
2.63	di-n-octyl phthalate	18
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D130. E.H. RICHARDSON 021734 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.65	tributyl phosphate	∿20
1.74	diethyl phthalate	<1
1.75	column/septum bleed	
1.97	D-10 ANTHRACENE	IS
2.09	di-n-butyl phthalate	17
2.15	tetracosane	3
2.16	column/septum bleed	
2.25	pentacosane	6
2.29	column/septum bleed	
2.35	column/septum bleed	
2.53	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	14
2.68	column/septum bleed	
2.86	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D131. E.H. RICHARDSON 021735 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.97	column/septum bleed	
2.17	column/septum bleed	
2.35	column/septum bleed	
2.52	column/septum bleed	
2.57	bis-(2-ethylhexyl)phthalate	1
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D132. E.H. RICHARDSON 021735 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.74	diethyl phthalate	<1
1.75	column/septum bleed	
1.97	D-10 ANTHRACENE	IS
2.08	di-n-butyl phthalate	4
2.17	column/septum bleed	
2.35	column/septum bleed	
2.54	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	4
2.65	column/septum bleed	
2.68	column/septum bleed	
2.80	column/septum bleed	
3.11	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D133. E.H. RICHARDSON 021736 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.97	column/septum bleed	
2.08	di-n-butyl phthalate	2
2.17	column/septum bleed	
2.34	dolumn/septum bleed	
2.46	unknown	
2.53	column/septum bleed	
2.57	bis-(2-ethylhexyl) phthalate	16
2.62	di-n-octyl phthalate	16
2.68	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D134. E.H. RICHARDSON 021736 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.74	diethyl phthalate	<1
1.75	column/septum bleed	
1.97	D-10 ANTHRACENE	IS
2.05	tricosane	1
2.09	di-n-butyl phthalate	1
2.14	tetracosane	2
2.16	column/septum bleed	
2.25	pentacosane	2
2.35	column/septum bleed	
2.52	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	7
2.68	column/septum bleed	
2.87	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D135. E.H. RICHARDSON 021739 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.42	solvent impurity	
1.48	solvent impurity	
1.54	column/septum bleed	
1.71	unknown	
1.77	diethyl phthalate	<1
1.79	column/septum bleed	
1.90	unknown	
2.06	solvent impurity	
2.12	di-*n*-butyl phthalate	2
2.22	unknown	
2.52	unknown	
2.63	bis-(2-ethylhexyl) phthalate	11
2.67	di-*n*-octyl phthalate	11

*Relative to the internal standard D-4 dibromobenzene.

TABLE D136. E.H. RICHARDSON 021739 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.72	diethyl phthalate	<1
1.74	column/septum bleed	
1.95	D-10 ANTHRACENE	IS
2.06	di-n-butyl phthalate	1
2.15	column/septum bleed	
2.33	column/septum bleed	
2.50	column/septum bleed	
2.54	bis-(2-ethylhexyl) phthalate	
2.57	di-n-octyl phthalate	6
2.66	column/septum bleed	
2.85	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D137. E.H. RICHARDSON 021744 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.24	column/septum bleed	
1.74	diethyl phthalate	<1
1.76	column/septum bleed	
1.86	unknown	
2.09	di-n-butyl phthalate	2
2.39	unknown	
2.47	unknown	
2.58	bis-(2-ethylhexyl) phthalate	11
2.60	di-n-octyl phthalate	11

*Relative to the internal standard D-4 dibromobenzene.

TABLE D138. E.H. RICHARDSON 021744 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.17	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.74	diethyl phthalate	1
1.83	eicosane	1
1.95	D-10 ANTHRACENE	IS
1.98	methyl-n-pentadecanoate (tentative)	NQ
2.05	tricosane	3
2.07	unknown	
2.15	tetracosane	<1
2.23	pentacosane	5
2.32	column/septum bleed	
2.41	unknown	
2.50	column/septum bleed	
2.55	bis-(2-ethylhexyl) phthalate	10
2.59	di-n-octyl phthalate	
2.66	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D139. E.H. RICHARDSON 021755 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.20	$C_7H_{16}O_2$ isomer (tentative)	NQ
2.02	column/septum bleed	
2.07	octasulfur	NQ
2.21	di-n-butyl phthalate	1
2.40	column/septum bleed	
2.44	unknown	
2.56	column/septum bleed	
2.62	bis-(2-ethylhexyl)phthalate	8
2.73	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D140. E.H. RICHARDSON 021755 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.18	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.27	C_7H_5NS isomer (tentative)	NQ
1.30	unknown	
1.75	diethyl phthalate	2
1.78	unknown	
1.98	D-10 ANTHRACENE	IS
2.06	tricosane	4
2.09	di-n-butyl phthalate	9
2.17	column/septum bleed	
2.25	pentacosane	2
2.29	unknown	
2.36	column/septum bleed	
2.45	unknown	
2.53	column/septum bleed	
2.57	bis-(2-ethylhexyl) phthalate	14
2.63	di-n-octyl phthalate	
2.68	column/septum bleed	
2.86	column/septum bleed	
3.17	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D141. E.H. RICHARDSON 021745 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.40	unknown	
1.51	column/septum bleed	
1.74	diethyl phthalate	<1
1.76	column/septum bleed	
1.87	unknown	
1.99	D-10 ANTHRACENE	IS
2.10	di-n-butyl phthalate	1
2.57	bis-(2-ethylhexyl) phthalate	2

*Relative to the internal standard D-4 dibromobenzene.

TABLE D142. E.H. RICHARDSON 021745 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.85	tridecane	27
1.00	D-4 DIBROMOBENZENE	IS
1.17	$C_7H_{16}O_2$ isomer (tentative)	NQ
1.75	column/septum bleed	
1.95	column/septum bleed	
2.06	di-n-butyl phthalate	1
2.15	column/septum bleed	
2.33	column/septum bleed	
2.44	unknown	
2.50	column/septum bleed	
2.55	bis-(2-ethylhexyl) phthalate	13
2.58	di-n-octyl phthalate	
2.70	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D143. E.H. RICHARDSON 021748 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.67	1,3-dichlorobenzene	6
1.00	D-4 DIBROMOBENZENE	IS
1.64	column/septum bleed	
1.74	column/septum bleed	
1.96	column/septum bleed	
2.07	di-n-butyl phthalate	3
2.15	column/septum bleed	
2.33	column/septum bleed	
2.50	column/septum bleed	
2.56	bis-(2-ethylhexyl) phthalate	<1
2.59	di-n-octyl phthalate	<1
2.66	column/septum bleed	
2.85	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D144. E.H. RICHARDSON 021748 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.68	unknown	
1.78	diethyl phthalate	<1
1.79	column/septum bleed	
2.01	D-10 ANTHRACENE	IS
2.04	methyl-n-octadecanoate	~3
2.13	di-n-butyl phthalate	8
2.20	tetracosane	1
2.29	column/septum bleed	
2.30	pentacosane	1
2.39	column/septum bleed	
2.56	column/septum bleed	
2.61	bis-(2-ethylhexyl) phthalate	10
2.65	di-n-octyl phthalate	
2.73	column/septum bleed	

*Relative of the internal standard D-4 dibromobenzene.

TABLE D145. E.H. RICHARDSON 021749 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.79	column/septum bleed	
2.02	column/septum bleed	
2.13	di-n-butyl phthalate	6
2.21	column/septum bleed	
2.39	column/septum bleed	
2.56	column/septum bleed	
2.61	bis-(2-ethylhexyl)phthalate	14
2.70	di-n-octyl phthalate	14
2.73	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D146. E.H. RICHARDSON 021749 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-4 DIBROMOBENZENE	IS
1.79	diethyl phthalate	<1
2.02	column/septum bleed	
2.13	di-n-butyl phthalate	4
2.21	column/septum bleed	
2.40	column/septum bleed	
2.56	column/septum bleed	
2.62	bis-(2-ethylhexyl) phthalate	19
2.68	di-n-octyl phthalate	
2.73	column/septum bleed	

*Relative to the internal standard D-4 dibromobenzene.

TABLE D147. LELAND OLDS FLY ASH A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.96	column/septum bleed	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE D148. LELAND OLDS FLY ASH B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.94	unknown	
1.00	D-10 ANTHRACENE	IS
1.36	bis-(2-ethylhexyl)phthalate	19000

*Relative to the internal standard D-10 Anthracene.

TABLE D149. MILTON YOUNG FLY ASH A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.75	unknown	
0.91	unknown	
0.93	unknown	
0.98	unknown	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.10	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D150. MILTON YOUNG FLY ASH B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.91	diethylphthalate	7100
0.93	unknown	
0.95	column/septum bleed	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.10	di-_n_-butylphthalate	9500
1.37	bis-(2-ethylhexyl)phthalate	29000

*Relative to the internal standard D-10 Anthracene.

TABLE D151. BIG STONE FLY ASH A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.90	diethylphthalate	2400
0.93	unknown	
0.93	unknown	
0.94	column/septum bleed	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.09	di-_n_-butylphthalate	9600
1.12	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D152. BIG STONE FLY ASH B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.91	diethylphthalate	2300
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.37	bis-(2-ethylhexyl)phthalate	13000

*Relative to the internal standard D-10 Anthracene.

TABLE D153. HOOT LAKE FLY ASH A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.11	unknown	
1.37	bis-(2-ethylhexyl)phthalate	4800

*Relative to the internal standard D-10 Anthracene.

TABLE D154. HOOT LAKE FLY ASH B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.11	unknown	
1.20	unknown	
1.37	bis-(2-ethylhexyl)phthalate	21000
1.48	air spike	

*Relative to the internal standard D-10 Anthracene.

TABLE D155. FLY ASH UPA A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.15	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D156. FLY ASH UPA B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.27	bis-(2-ethylhexyl)phthalate	31000

*Relative to the internal standard D-10 Anthracene.

TABLE D157. FLY ASH 0120-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.92	carboxylic acid (tentative)	NQ
0.94	column/septum bleed	
1.00	D-10 ANTHRACENE	IS
1.11	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D158. FLY ASH 0120-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.92	unknown	
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.04	unknown	
1.12	unknown	
1.37	bis-(2-ethylhexyl)phthalate	19000

*Relative to the internal standard D-10 Anthracene.

TABLE D159. FLY ASH 10-3 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.33	unknown	
0.91	diethylphthalate	3900
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.37	bis-(2-ethylhexyl)phthalate	6100
1.44	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D160. FLY ASH 10-3 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.91	diethylphthalate	3100
0.95	column/septum bleed	
1.00	D-10 ANTHRACENE	IS
1.37	bis-(2-ethylhexyl)phthalate	20000

*Relative to the internal standard D-10 Anthracene.

TABLE D161. FLY ASH 8-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.15	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D162. FLY ASH 8-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.88	diethylphthalate	7600
1.00	D-10 ANTHRACENE	IS
1.15	blank contaminant	
1.28	bis-(2-ethylhexyl)phthalate	24000

*Relative to the internal standard D-10 Anthracene.

TABLE D163. FLY ASH 1209-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	air spike	
0.96	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE D164. FLY ASH 1209-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.94	unknown	
1.00	D-10 ANTHRACENE	IS
1.36	bis-(2-ethylhexyl)phthalate	28000

*Relative to the internal standard D-10 Anthracene.

TABLE D165. FLY ASH 0124-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE D166. FLY ASH 0124-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.93	unknown	
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.37	bis-(2-ethylhexyl)phthalate	23000

*Relative to the internal standard D-10 Anthracene.

TABLE D167. FLY ASH 17-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.95	column/septum bleed	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.09	di-n-butylphthalate	1800

*Relative to the internal standard D-10 Anthracene.

TABLE D168. FLY ASH 17-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.11	unknown	
1.36	bis-(2-ethylhexyl)phthalate	24000

*Relative to the internal standard D-10 Anthracene.

TABLE D169. FLY ASH 0116-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.91	unknown	
0.94	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE D170. FLY ASH 0116-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.77	unknown	
0.93	unknown	
0.95	unknown	
1.00	D-10 ANTHRACENE	IS
1.02	unknown	
1.12	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D171. FLY ASH 1005-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.94	unknown	
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.10	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE D172. FLY ASH 1005-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.87	unknown	
1.00	D-10 ANTHRACENE	IS
1.25	bis-(2-ethylhexyl)phthalate	34000

*Relative to the internal standard D-10 Anthracene.

TABLE D173. LELAND OLDS FLY ASH POND WATER A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.92	unknown	
0.97	unknown	
1.00	D-10 ANTHRACENE	IS
1.07	unknown alkene	
1.10	unknown phthalate	

*Relative to the internal standard D-10 Anthracene.

TABLE D174. LELAND OLDS FLY ASH POND WATER B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.79	9,10-dideutero-perdeutero-phenanthrene (tentative) (tentative)	NQ
0.92	unknown	
0.97	unknown	
1.00	D-10 ANTHRACENE	IS
1.07	unknown	
1.10	unknown phthalate	

*Relative to the internal standard D-10 Anthracene.

APPENDIX E
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES
COAL LIQUEFACTION OPERATIONS

Organization	Site	Sample description	Sample code
DOE	Ft. Lewis, WA	Final effluent from pilot plant	#9WWTPI
DOE	Ft. Lewis, WA	Final effluent from pilot plant	#10WWTPI

TABLE E1. FT. LEWIS COAL LIQUEFACTION SAMPLE #9WWTPI VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.20	acetonitrile	2400
0.26	methylene chloride	32
0.30	acetone	>1800
0.33	carbon disulfide	1
0.36	propanenitrile (tentative)	NQ
0.43	C_5H_{10} isomer (tentative)	NQ
0.51	chloroform	400
0.57	unknown	
0.59	2-butanone	990
0.69	cyclohexane	3700
0.76	methylcyclopentane	87
0.81	C_6H_{10} isomer (tentative)	NQ
0.91	trichloroethylene	13
0.93	methylcyclopentene isomer (tentative)	NQ
0.96	benzene	360
1.00	1,2-DIBROMOETHANE	IS
1.13	methylcyclohexane	380
1.33	noise spike	
1.48	toluene	1100
1.51	C_8H_{16} isomer (tentative)	NQ
1.63	C_9H_{16} isomer (tentative)	NQ
1.69	noise spike	
1.73	ethylbenzene	520
1.84	C_9H_{12} isomer	$\sim$50
1.93	C_9H_{18} isomer (tentative)	NQ
1.98	m- and/or p-xylene	520
2.01	o-xylene	1000
2.05	n-propylbenzene	2300
2.14	naphthalene (tentative)	NQ
2.17	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	$\sim$500
2.25	o-ethyltoluene	540
2.31	$C_{10}H_{14}$ isomer + column artifact	$\sim$170
2.47	C_{11} alkane (tentative) + unknown	NQ
2.55	$C_{10}H_{12}$ isomer (tentative)	NQ
2.66	C_9H_{12} isomer	$\sim$130
2.74	$C_{10}H_{12}$ isomer (tentative)	NQ
2.77	tetrahydronaphthalene isomer (tentative) +	NQ
	C_9H_{12} isomer	$\sim$1100
2.99	C_9H_{12} isomer	$\sim$420

*Relative to the internal standard D-10 Anthracene.

TABLE E2. FT. LEWIS COAL LIQUEFACTION SAMPLE #10WWTPI VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	air	
0.16	noise spike	
0.26	methylene chloride	27
0.30	acetone	90
0.34	carbon disulfide	<1
0.51	chloroform	2
0.98	benzene	1
1.00	1,2-DIBROMOETHANE	IS
1.50	toluene	10
1.71	ethylbenzene	1
1.83	column artifact	
1.96	m- and/or p-xylene	5
2.00	o-xylene	19
2.05	n-propylbenzene	9
2.20	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	~8
2.70	$C_{11}H_{14}$ isomer (tentative) + unknown	NQ
2.88	$C_{10}H_{12}$ isomer (tentative) + unknown	NQ

*Relative to the internal standard D-10 Anthracene.

TABLE E3. FT. LEWIS COAL LIQUEFACTION DERIVATIZED SAMPLE #9WWTPI.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.44	TMS-phenol	4200
0.51	TMS-o-cresol	5500
0.52	TMS-m-cresol	~8200
0.53	TMS-p-cresol	5400
0.54	naphthalene	~1800
0.57	TMS-ethylphenol isomer	~2400
0.59	TMS-dimethylphenol isomer	~2500
0.60	TMS-C_2 alkylphenol isomer	~11000
0.61	TMS-ethylphenol isomer	~3700
0.61	TMS-dimethylphenol isomer	~810
0.62	unknown	
0.63	TMS-C_2 alkylphenol isomer	~1400
0.64	TMS-C_3 alkylphenol isomer	~870
0.65	methylnaphthalene isomer + unknown	~3600
0.66	TMS-C_3 alkylphenol isomer	~1800
0.66	TMS-C_3 alkylphenol isomer	~2100
0.67	TMS-C_3 alkylphenol isomer	~1900
0.68	TMS-~C_3 alkylphenol isomer (tentative)	NQ
0.69	TMS-C_3 alkylphenol isomer	~290
0.70	TMS-C_4 alkylphenol isomer	~750
0.71	biphenyl + unknown (tentative)	NQ
0.73	C_8 alkylphenol isomer	~7800
0.75	C_8 alkylphenol isomer	~6300
0.75	n-tetradecane	1800
0.76	unknown	
0.77	unknown	
0.78	unknown	
0.79	unknown	
0.82	unknown	
0.86	fluorene	580
0.87	diethyl phthalate	2800
0.88	unknown	
0.90	impure hexadecane	~250
0.97	n-heptadecane	190
0.99	$C_{14}H_{10}$ isomer	~1200
1.00	D-10 ANTHRACENE	IS
1.09	n-nonadecane	120
1.19	$C_{16}H_{10}$ isomer (tentative)	NQ

*Relative to the internal standard D-10 Anthracene.

TABLE E4. FT. LEWIS COAL LIQUEFACTION DERIVATIZED SAMPLE #10WWTPI.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.43	TMS-phenol	790
0.51	TMS-o-cresol	2000
0.52	TMS-m-cresol	∿3200
0.52	TMS-p-cresol	2100
0.57	TMS-C_2 alkylphenol isomer	∿1300
0.58	TMS-dimethylphenol isomer	∿1300
0.59	TMS-ethylphenol isomer	∿3300
0.59	TMS-dimethylphenol isomer	∿4200
0.60	TMS-ethylphenol isomer	∿2400
0.61	TMS-dimethylphenol isomer	∿540
0.62	unknown	
0.62	TMS-C_2 alkylphenol isomer	∿940
0.63	TMS-C_3 alkylphenol isomer	∿360
0.65	TMS-C_3 alkylphenol isomer	∿780
0.66	TMS-C_3 alkylphenol isomer	∿1000
0.66	TMS-C_3 alkylphenol isomer	∿830
0.67	TMS-C_3 alkylphenol isomer	∿430
0.68	TMS-C_3 alkylphenol isomer	∿1100
0.72	C_8 alkylphenol isomer	∿2200
0.74	C_8 alkylphenol isomer	∿2600
0.75	n-tetradecane	1200
0.82	unknown	
1.00	D-10 ANTHRACENE	IS
1.30	n-tricosane	24
1.35	n-tetracosane	35
1.41	bis-(2-ethylhexyl) phthalate	∿810
1.46	n-hexacosane	38

*Relative to the internal standard D-10 Anthracene.

APPENDIX F
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES
COAL GASIFICATION OPERATIONS

Organization	Site	Sample description	Sample code
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #3 on 8-5-77 preburn	080577-WS-3
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #6 on 8-5-77 preburn	080577-WS-6
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #8 on 8-5-77 preburn	080577-WS-8
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #9 on 8-5-77 preburn	080577-WS-9
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #1 on 10-4-77	100477-WS-1
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #2 on 10-4-77	100477-WS-2
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #3 on 10-4-77	100477-WS-3
DOE/LLL	Hoe Creek II, Gillette, WY	Unfiltered water collected from well #5 on 10-4-77	100477-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #7 on 10-4-77	100477-WS-7
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #9 on 10-4-77	100477-WS-9
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from production well B on 10-4-77	100477-B
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #2 on 12-2-77	120277-WS-2
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #4 on 12-2-77	120277-WS-4
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 12-2-77	120277-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #2 on 1-6-78	010678-WS-2
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #3 on 1-5-78	010578-WS-3
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #4 on 1-4-78	010478-WS-4
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 1-4-78	010478-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #6 on 1-4-79	010478-WS-6
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #7 on 1-4-78	010478-WS-7

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #8 on 1-4-78	010478-WS-8
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #9 on 1-4-79	010478-WS-9
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well A on 1-16-78	011678-A
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well B on 1-16-78	011678-B
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well A on 2-14-78	021478-A
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well C on 2-14-78	021478-C
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #1 on 2-14-78	021478-WS-1
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #3 on 2-14-78	021478-WS-3
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #5 on 2-14-78	021478-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #8 on 2-14-78	021478-WS-8
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well A on 4-10-78	041078-A
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well B on 4-11-78	041178-B
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #1 on 4-11-78	041178-WS-1
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #3 on 4-10-78	041078-WS-3
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #5 on 4-10-78	041078-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water sample from well #8 on 4-10-78	041078-WS-8
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well A on 6-13-78	061378-A
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #1 on 6-13-78	061378-WS-1
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #2 on 6-13-78	061378-WS-2
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 6-13-78	061378-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #6 on 6-13-78	061378-WS-6

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #8 on 6-13-78	061378-WS-8
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #1 on 9-21-78	092178-WS-1
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #3 on 9-21-78	092178-WS-3
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #5 on 9-21-78	092178-WS-5
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #6 on 9-21-78	092178-WS-6
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #8 on 9-21-78	092178-WS-8
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #10 on 11-31-78	113178-WS-10
DOE/LLL	Hoe Creek II Gillette, WY	Unfiltered water collected from well #12 on 11-31-78	113178-WS-12
DOE/LLL	Hoe Creek II Gillette, WY	Liquid condensate and tar collected on 10-30-77	LC 101077
DOE/LLL	Hoe Creek II Gillette, WY	Liquid condensate and tar collected on 12-1-77	LC 011277
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-17-77 preburn	UCG-001
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-17-77 preburn	UCG-002
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-17-77	UCG-003
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-17-77 preburn	UCG-004
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-17-77 preburn	UCG-005
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-17-77 preburn	UCG-006
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-23-77	UCG-007
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-23-77	UCG-008
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected 5-23-77	UCG-009
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-23-77	UCG-010
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-23-77	UCG-011

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected 5-23-77	UCG-012
DOE/LETC	Hanna III Laramie, WY	Blank distilled water after setting in PVC samples on 5-23-77	UCG-013
DOE/LETC	Hanna III Laramie, WY	Blank distilled water after setting in PVC samples on 5-23-77	UCG-014
DOE/LETC	Hanna III Laramie, WY	Blank distilled water after setting in PVC samples on 5-23-77	UCG-015
DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-13-77	UCG-016
DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-13-77	UCG-017
DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-13-77	UCG-018
DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-19-77	UCG-019
DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-19-77	UCG-020
DOE/LETC	Hanna III Laramie, WY	Product water condensed from production stream during gasification collected on 7-19-77	UCG-021
DOE?LETC	Hanna III Laramie, WY	Product tar condensed from production stream during gasification on 7-13-77	UCG-022
DOE/LETC	Hanna III Laramie, WY	Product tar condensed from production stream during gasification on 7-19-77	UCG-023
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #2 collected on 7-12-78	III-2-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #6 collected on 7-12-78	III-6-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #7 collected on 7-12-78	III-7-7

(Continued)

SAMPLE LIST (continued).

Organization	Site	Sample description	Sample code
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #8 collected on 7-12-78	III-8-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #9 collected on 7-12-78	III-9-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #10 collected on 7-12-78	III-10-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #11 collected on 7-12-78	III-11-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #12 collected on 7-12-78	III-12-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #13 collected on 7-12-78	III-13-7
DOE/LETC	Hanna III Laramie, WY	Unfiltered water from well #14 collected on 7-12-78	III-14-7
DOE/GFETC	Grand Forks, ND	Product tar from slagging gasifier experiment RA-18 collected 5-9-77	Product tar RA-18
DOE/GFETC	Grand Forks, ND	Aqueous product liquor from slagging gasifier experiment RA-18 collected 5-19-77	Aqueous Product Liquor RA-18
DOE/PETC	Pittsburgh, PA	Bottom ash from an industrial fixed-bed, air-blown, atmospheric pressure gasifier collected 3-21-78	HG-2
DOE/PETC	Pittsburgh, PA	Dust collected from producer gas in industrial fixed-bed, air-blown, atmospheric pressure gasifier collected 3-21-78	HG-9

TABLE F1. MERCURY ANALYSIS FOR SAMPLES FROM LLL.

Sample Number	Concentration (ppb)
080577 - WS-3 (Background)	<0.2
080577 - WS-6 (Background)	<0.2
080577 - WS-8 (Background)	<0.2
080577 - WS-9 (Background)	<0.2
100477 - WS-1	<0.2
100477 - WS-2	<0.2
100477 - WS-3	<0.2
100477 - WS-5	0.4
100477 - WS-7	<0.2
100477 - WS-9	1.2
021277-WS2-3	0.2*
021277-WS4-3	<0.4
021277-WS-5-3	<0.08*
010678-WS2-L	<0.2
010578-WS3-L	<0.2
010478-WS4-L	<0.2
010478-WS5-L	<0.3
010478-WS6-L	<0.2
010478-WS7-L	<0.2
010478-WS8-7	<0.3
010478-WS9-L	<0.2
011678-A-L	<0.2
011678-B-L	0.2
021378-A-L	<0.2
021478-C-L	0.2
021478-WS1-L	0.7
021378-WS3-L	<0.2
021478-WS5-L	<0.2
041078-A-L	<0.2
041178-B-L	<0.2
041178-WS1-L	<0.2
041178-WS3-L	<0.2
041078-WS5-L	<0.2
041078-WS8-L	<0.2
061378-A-L	0.8
061378-WS1-L	<0.2
061378-WS2-L	1.3
061378-WS5-L	1.6
061378-WS6-L	<0.2
061378-WS8-L	1.8

*µg/g

(continued)

TABLE F1. (continued)

Sample Number	Concentration (ppb)
092178-WS-1	<0.2
092178-WS-3	<0.2
092178-WS-5	<0.2
092178-WS-6	<0.2
092178-WS-8	<0.2
112178-WS-10	<2
113178-WS-12	<2
LC-01-12-77	0.14
LC-30-10-77	0.13

TABLE F2. MERCURY ANALYSIS OF EFFLUENTS FROM LARAMIE ENERGY TECHNOLOGY CENTER

Sample number	Concentration (ppb Hg)
UCG-003	<0.2
UCG-006	<0.2
UCG-009	<0.2
UCG-012	<0.2
UCG-013	<0.2
UCG-015	<0.5
UCG-022	0.5*
UCG-023	1.3*
000-2-7-4	<0.2
III-6-7-4	<0.2
III-7-7-4	<0.2
III-8-7-4	<0.2
III-9-7-4	<0.2
III-10-7-4	<0.2
III-11-7-4	<0.2
III-12-7-4	<0.2
III-13-7-4	<0.2
III-14-7-4	<0.2

*μg/g

TABLE F3. MERCURY ANALYSIS OF PRODUCT TAR SAMPLE FROM THE GRAND FORKS ENERGY RESEARCH CENTER COAL GASIFICATION PROJECT

Sample Identification	Concentration (μg/g Hg)
Product Tar RA-18	0.20
Aqueous Product Liquor RA-18	0.10

TABLE F4. MERCURY ANALYSIS OF SAMPLES FROM PITTSBURGH ENERGY RESEARCH CENTER

Sample Number	Concentration (μg/g Hg)
HG-2	<0.01
HG-9	<0.01

TABLE F5. SSMS DATA FOR BACKGROUND SAMPLE FOR LAWRENCE LIVERMORE #080577-WS-3.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈1	Neodymium	<0.001	Strontium	0.4
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.007	Sulfur	>5
Arsenic	≤0.001	Gallium	≤0.001	Niobium	0.001	Tantalum	<0.001
Barium	0.08	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.07	Indium	STD	Potassium	>9	Thulium	<0.001
Cadmium	<0.001	Iodine	≤0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	≤0.001	Rhenium	<0.001	Titanium	0.04
Cerium	<0.001	Iron	0.08	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	<0.001
Chlorine	0.1	Lead	0.006	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.003	Lithium	0.07	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.02	Magnesium	MC	Selenium	≤0.001	Zinc	0.1
Dysprosium	<0.001	Manganese	0.1	Silicon	5	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>2		

NR-Not Reported

MC-Major Component

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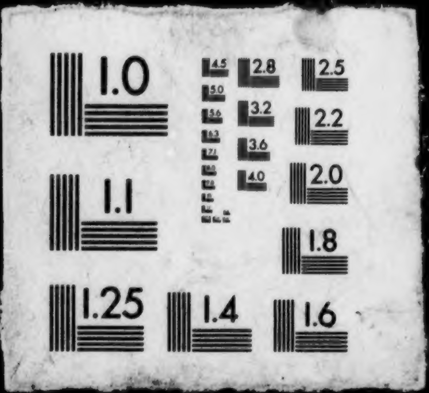

TABLE F6. SSMS DATA FOR BACKGROUND SAMPLE FOR LAWRENCE LIVERMORE #080577-WS-6.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.5	Fluorine	≃2	Neodymium	<0.001	Strontium	0.8
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.001	Sulfur	>3
Arsenic	≤0.001	Gallium	≤0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.06	Thallium	<0.001
Boron	0.005	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>6	Thulium	<0.001
Cadmium	<0.001	Iodine	<0.001	Praseodymium	<0.001	Tin	0.004
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	<0.001	Iron	0.3	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.003	Uranium	0.07
Chlorine	0.3	Lead	0.004	Ruthenium	<0.001	Vanadium	≤0.001
Chromium	0.006	Lithium	0.05	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	≤0.001	Zinc	0.08
Dysprosium	<0.001	Manganese	0.08	Silicon	MC	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.005	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE F7. SSMS DATA FOR BACKGROUND SAMPLE FOR LAWRENCE LIVERMORE #080577-WS-8.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈1	Neodymium	<0.001	Strontium	0.4
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.003	Sulfur	>7
Arsenic	≤0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.05	Thallium	<0.001
Boron	0.001	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.002	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	*0.003	Iron	0.3	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	*0.005	Rubidium	0.002	Uranium	0.01
Chlorine	0.2	Lead	0.008	Ruthenium	<0.001	Vanadium	≤0.001
Chromium	0.006	Lithium	0.04	Samarium	<0.001	Ytterbium	≤0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	≤0.006	Zinc	0.07
Dysprosium	<0.001	Manganese	0.06	Silicon	2	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>3		

NR-Not Reported *Heterogeneous

MC-Major Component

TABLE F8. SSMS DATA FOR BACKGROUND SAMPLE FOR LAWRENCE LIVERMORE #080577-WS-9.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈1	Neodymium	<0.001	Strontium	0.9
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.003	Sulfur	MC
Arsenic	≤0.001	Gallium	≤0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	0.1	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.05	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	0.05	Titanium	0.05
Cerium	<0.001	Iron	3	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.002	Uranium	<0.001
Chlorine	1	Lead	0.009	Ruthenium	<0.001	Vanadium	≤0.001
Chromium	≤0.001	Lithium	0.3	Samarium	0.001	Ytterbium	<0.001
Cobalt	≤0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.007	Magnesium	MC	Selenium	≤0.002	Zinc	0.1
Dysprosium	<0.001	Manganese	0.2	Silicon	3	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.009	Sodium	MC		

NR-Not Reported

MC-Major Component

TABLE F9. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WS-1.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈1	Neodymium	<0.001	Strontium	3
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.001	Sulfur	>2
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.05	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	<0.001	Iodine	<0.001	Praseodymium	<0.001	Tin	0.003
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.003
Cerium	0.001	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.002	Uranium	0.003
Chlorine	0.1	Lead	0.1	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.001	Lithium	0.03	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	0.001	Zinc	<0.001
Dysprosium	<0.001	Manganese	0.4	Silicon	3	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.004	Sodium	≥1		

NR-Not Reported

MC-Major Component

TABLE F10. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WS-2.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.3	Neodymium	<0.001	Strontium	0.6
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.02	Sulfur	>6
Arsenic	0.001	Gallium	<0.001	Niobium	≤0.002	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.04	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	<0.001	Iron	5	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.001	Uranium	<0.001
Chlorine	0.1	Lead	<0.001	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.002	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.3	Magnesium	MC	Selenium	0.01	Zinc	0.2
Dysprosium	<0.001	Manganese	0.3	Silicon	3	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE F11. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WS-3.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈2	Neodymium	0.01	Strontium	0.3
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>5
Arsenic	0.01	Gallium	0.03	Niobium	0.02	Tantalum	<0.001
Barium	0.4	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.9	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	<0.001	Praseodymium	0.004	Tin	0.003
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	2
Cerium	0.03	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.005	Lanthanum	0.03	Rubidium	0.03	Uranium	<0.001
Chlorine	0.2	Lead	0.1	Ruthenium	<0.001	Vanadium	0.03
Chromium	0.04	Lithium	0.1	Samarium	0.004	Ytterbium	<0.001
Cobalt	0.004	Lutetium	<0.001	Scandium	0.01	Yttrium	0.01
Copper	0.03	Magnesium	MC	Selenium	0.02	Zinc	0.5
Dysprosium	<0.001	Manganese	1	Silicon	MC	Zirconium	0.04
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	0.001	Molybdenum	0.02	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE F12. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WS-5.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.2	Neodymium	<0.001	Strontium	0.3
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>5
Arsenic	0.001	Gallium	<0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.08	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.6	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	<0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	<0.001	Iron	4	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.001	Uranium	<0.001
Chlorine	0.1	Lead	0.06	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.002	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.001
Copper	0.1	Magnesium	MC	Selenium	0.005	Zinc	0.2
Dysprosium	<0.001	Manganese	0.3	Silicon	5	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE F13. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WS-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈1	Neodymium	<0.001	Strontium	0.2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.004	Sulfur	>3
Arsenic	<0.001	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.001	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.02	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	<0.001	Potassium	>5	Thulium	<0.001
Cadmium	0.001	Iodine	0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.002
Cerium	<0.001	Iron	3	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.02	Lanthanum	0.001	Rubidium	0.001	Uranium	0.01
Chlorine	0.1	Lead	0.02	Ruthenium	<0.001	Vanadium	<0.001
Chromium	<0.001	Lithium	INT	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	0.002	Zinc	0.03
Dysprosium	<0.001	Manganese	0.1	Silicon	3	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>1		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE F14. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WS-9.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.1	Neodymium	<0.001	Strontium	0.3
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>6
Arsenic	0.001	Gallium	<0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.04	Thallium	<0.001
Boron	0.002	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.002	Iodine	<0.001	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	<0.001	Iron	1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.001	Uranium	<0.001
Chlorine	0.1	Lead	0.06	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.002	Lithium	0.01	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.001
Copper	0.01	Magnesium	7	Selenium	0.003	Zinc	0.1
Dysprosium	<0.001	Manganese	0.1	Silicon	7	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE F15. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #100477-WELL B.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈0.4	Neodymium	<0.001	Strontium	1
Antimony	0.001	Gadolinium	<0.001	Nickel	0.005	Sulfur	>4
Arsenic	<0.001	Gallium	<0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.1	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Brcmine	0.02	Indium	STD	Potassium	>7	Thulium	<0.001
Cadmium	≤0.001	Iodine	0.001	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.001	Iron	4	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.002	Uranium	<0.001
Chlorine	0.1	Lead	0.03	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.002	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	MC	Selenium	0.003	Zinc	0.04
Dysprosium	<0.001	Manganese	0.3	Silicon	5	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE F16. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #WS120277-2-3 HOE CREEK.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>5	Fluorine	≈0.05	Neodymium	<0.005	Strontium	0.4
Antimony	<0.005	Gadolinium	<0.005	Nickel	0.06	Sulfur	MC
Arsenic	0.5	Gallium	0.004	Niobium	0.01	Tantalum	<0.005
Barium	1	Germanium	≤0.008	Osmium	<0.005	Tellurium	<0.005
Beryllium	<0.005	Gold	<0.005	Palladium	<0.005	Terbium	<0.005
Bismuth	<0.005	Hafnium	<0.005	Phosphorus	1	Thallium	<0.005
Boron	0.01	Holmium	<0.005	Platinum	<0.005	Thorium	<0.005
Bromine	≤0.01	Indium	STD	Potassium	MC	Thulium	<0.005
Cadmium	<0.005	Iodine	<0.005	Praseodymium	<0.005	Tin	<0.005
Calcium	MC	Iridium	<0.005	Rhenium	<0.005	Titanium	3
Cerium	0.01	Iron	MC	Rhodium	<0.005	Tungsten	<0.005
Cesium	<0.005	Lanthanum	0.01	Rubidium	0.01	Uranium	≤0.06
Chlorine	0.3	Lead	8	Ruthenium	<0.005	Vanadium	0.04
Chromium	0.2	Lithium	0.02	Samarium	<0.005	Ytterbium	<0.005
Cobalt	0.04	Lutetium	<0.005	Scandium	≤0.001	Yttrium	0.004
Copper	5	Magnesium	MC	Selenium	0.03	Zinc	4
Dysprosium	<0.005	Manganese	0.4	Silicon	MC	Zirconium	0.04
Erbium	<0.005	Mercury	NR	Silver	<0.005		
Europium	<0.005	Molybdenum	0.06	Sodium	MC		

NR - Not Reported

MC - Major Component. Sample was thermally ashed @ 350°C for 30 min. in a laboratory furnace in quartz crucible prior to analysis.

TABLE F17. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #WS120277-4-3 HOE CREEK.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.3	Neodymium	< 0.001	Strontium	1
Antimony	<0.001	Gadolinium	< 0.001	Nickel	0.03	Sulfur	>2
Arsenic	0.006	Gallium	< 0.001	Niobium	< 0.001	Tantalum	< 0.001
Barium	0.07	Germanium	≤ 0.003	Osmium	< 0.001	Tellurium	≤0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.02	Thallium	< 0.001
Boron	0.02	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.03	Indium	STD	Potassium	>4	Thulium	< 0.001
Cadmium	≤0.004	Iodine	<0.001	Praseodymium	< 0.001	Tin	0.001
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.005
Cerium	<0.001	Iron	MC	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	< 0.001	Lanthanum	<0.001	Rubidium	0.006	Uranium	0.005
Chlorine	0.7	Lead	0.2	Ruthenium	< 0.001	Vanadium	<0.001
Chromium	0.007	Lithium	0.08	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	0.02	Lutetium	< 0.001	Scandium	≤ 0.001	Yttrium	<0.001
Copper	0.04	Magnesium	MC	Selenium	0.009	Zinc	0.2
Dysprosium	< 0.001	Manganese	0.3	Silicon	3	Zirconium	0.005
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.008	Sodium	>0.8		

NR - Not Reported
MC - Major Component

TABLE F18. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #WS120277-5-3 HOE CREEK.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≈0.4	Neodymium	<0.001	Strontium	2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.004	Sulfur	>7
Arsenic	0.005	Gallium	0.001	Niobium	0.002	Tantalum	<0.001
Barium	0.9	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.08	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.007	Iodine	0.002	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.02
Cerium	<0.001	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	<0.001
Chlorine	1	Lead	0.08	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.005	Lithium	0.009	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.1	Magnesium	MC	Selenium	<0.001	Zinc	0.3
Dysprosium	<0.001	Manganese	MC	Silicon	9	Zirconium	0.007
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>3		

NR - Not Reported

MC - Major Component

TABLE F19. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010678-WS2-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	MC	Neodymium	< 0.001	Strontium	3
Antimony	0.005	Gadolinium	< 0.001	Nickel	INT	Sulfur	> 2
Arsenic	0.1	Gallium	0.004	Niobium	0.001	Tantalum	< 0.001
Barium	0.1	Germanium	≤ 0.006	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.05	Thallium	< 0.001
Boron	0.5	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.5	Indium	STD	Potassium	> 3	Thulium	< 0.001
Cadmium	0.001	Iodine	0.06	Praseodymium	< 0.001	Tin	0.002
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.04
Cerium	0.001	Iron	0.3	Rhodium	< 0.001	Tungsten	0.02
Cesium	0.008	Lanthanum	0.001	Rubidium	0.5	Uranium	< 0.006
Chlorine	MC	Lead	0.1	Ruthenium	< 0.001	Vanadium	0.008
Chromium	0.001	Lithium	0.3	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	≤ 0.001	Lutetium	< 0.001	Scandium	< 0.001	Yttrium	< 0.001
Copper	< 0.07	Magnesium	MC	Selenium	0.002	Zinc	0.07
Dysprosium	< 0.001	Manganese	0.006	Silicon	MC	Zirconium	0.002
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.02	Sodium	> 0.7		

INT - Interference
NR - Not Reported
MC - Major Component

TABLE F20. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010578-WS3-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.3	Fluorine	≈0.1	Neodymium	0.001	Strontium	2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.009	Sulfur	>2
Arsenic	0.006	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.3	Germanium	0.002	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.06	Thallium	<0.001
Boron	0.3	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.06	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	0.004	Iodine	0.01	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.007
Cerium	0.002	Iron	MC	Rhodium	<0.001	Tungsten	0.002
Cesium	0.002	Lanthanum	0.002	Rubidium	0.05	Uranium	<0.001
Chlorine	0.07	Lead	5	Ruthenium	<0.001	Vanadium	0.005
Chromium	0.001	Lithium	0.08	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	1	Magnesium	MC	Selenium	≤0.01	Zinc	4
Dysprosium	<0.001	Manganese	0.9	Silicon	MC	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.008	Sodium	>0.7		

NR - Not Reported

MC - Major Component

TABLE F21. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010478-WS4-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.07	Fluorine	≈0.1	Neodymium	<0.001	Strontium	2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	MC
Arsenic	0.01	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	≤0.001	Hafnium	<0.001	Phosphorus	0.09	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.006
Bromine	0.09	Indium	STD	Potassium	>7	Thulium	<0.001
Cadmium	0.02	Iodine	≤0.001	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	≤0.001	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	≤0.001	Rubidium	0.01	Uranium	<0.001
Chlorine	0.3	Lead	0.3	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.01	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.004	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.001
Copper	0.03	Magnesium	MC	Selenium	≤0.01	Zinc	0.4
Dysprosium	<0.001	Manganese	0.3	Silicon	0.5	Zirconium	0.03
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>1		

TABLE F22. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010478-WS5-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈0.04	Neodymium	<0.001	Strontium	3
Antimony	≤0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>2
Arsenic	0.01	Gallium	≤0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.6	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.06	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.02	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	0.02	Iodine	0.001	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.003
Cerium	<0.001	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	≤0.001	Lanthanum	<0.001	Rubidium	0.002	Uranium	≤0.002
Chlorine	0.2	Lead	0.4	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.001	Lithium	0.03	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.003	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	MC	Selenium	0.003	Zinc	0.7
Dysprosium	<0.001	Manganese	0.9	Silicon	6	Zirconium	≤0.008
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.003	Sodium	>0.7		

NR - Not Reported
MC - Major Component

TABLE F23. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010478-WS6-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≈0.4	Neodymium	<0.001	Strontium	MC
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.01	Sulfur	>2
Arsenic	0.01	Gallium	<0.001	Niobium	<0.001	Tantalum	≤0.002
Barium	2	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.002
Bromine	0.05	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	0.009	Iodine	0.003	Praseodymium	<0.001	Tin	≤0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.003
Cerium	≤0.001	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	≤0.001	Rubidium	0.01	Uranium	0.01
Chlorine	0.4	Lead	0.2	Ruthenium	<0.001	Vanadium	<0.001
Chromium	≤0.001	Lithium	0.08	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	MC	Selenium	0.02	Zinc	0.2
Dysprosium	<0.001	Manganese	>3	Silicon	0.9	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.003	Sodium	>0.7		

NR - Not Reported
MC - Major Component

TABLE F24. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010478-WS7-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈4	Neodymium	0.001	Strontium	4
Antimony	0.002	Gadolinium	<0.001	Nickel	0.04	Sulfur	>2
Arsenic	0.02	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	1	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.06	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	0.02	Iodine	0.001	Praseodymium	0.001	Tin	0.005
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.003
Cerium	0.002	Iron	MC	Rhodium	<0.001	Tungsten	≤0.002
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.005	Uranium	0.008
Chlorine	0.3	Lead	0.7	Ruthenium	<0.001	Vanadium	0.001
Chromium	0.003	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.008	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.05	Magnesium	MC	Selenium	≤0.003	Zinc	0.2
Dysprosium	<0.001	Manganese	0.9	Silicon	0.6	Zirconium	0.008
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.007	Sodium	>0.7		

NR - Not Reported
MC - Major Component

TABLE F25. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010478-WS8-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.7	Fluorine	≈0.1	Neodymium	< 0.001	Strontium	7
Antimony	< 0.001	Gadolinium	< 0.001	Nickel	0.007	Sulfur	>4
Arsenic	0.01	Gallium	0.001	Niobium	< 0.001	Tantalum	< 0.001
Barium	5	Germanium	< 0.001	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.1	Thallium	< 0.001
Boron	< 0.01	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.06	Indium	STD	Potassium	>8	Thulium	< 0.001
Cadmium	0.007	Iodine	0.001	Praseodymium	0.001	Tin	0.006
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	< 0.01
Cerium	0.002	Iron	MC	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	< 0.001	Lanthanum	0.002	Rubidium	0.01	Uranium	≤ 0.005
Chlorine	0.8	Lead	0.3	Ruthenium	< 0.001	Vanadium	0.001
Chromium	0.002	Lithium	0.06	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	0.001	Lutetium	< 0.001	Scandium	≤ 0.001	Yttrium	0.001
Copper	0.4	Magnesium	MC	Selenium	≤ 0.008	Zinc	0.4
Dysprosium	< 0.001	Manganese	0.3	Silicon	MC	Zirconium	0.002
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.003	Sodium	>2		

NR - Not Reported
MC - Major Component

TABLE F26. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #010478-WS9-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.003	Fluorine	=0.04	Neodymium	<0.001	Strontium	4
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.03	Sulfur	>2
Arsenic	0.03	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	3	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.05	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.06	Indium	STD	Potassium	0.3	Thulium	<0.001
Cadmium	0.2	Iodine	<0.001	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.01
Cerium	0.002	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.002	Uranium	0.01
Chlorine	0.2	Lead	0.2	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.01	Lithium	<0.001	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.01	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.03	Magnesium	MC	Selenium	≤0.02	Zinc	0.2
Dysprosium	<0.001	Manganese	0.9	Silicon	0.09	Zirconium	0.004
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>0.7		

NR - Not Reported
MC - Major Component

TABLE F27. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #011678-A-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≃3	Neodymium	<0.008	Strontium	6
Antimony	<0.008	Gadolinium	<0.008	Nickel	0.04	Sulfur	MC
Arsenic	0.02	Gallium	<0.008	Niobium	0.01	Tantalum	<0.008
Barium	0.4	Germanium	≤0.02	Osmium	<0.008	Tellurium	<0.008
Beryllium	<0.008	Gold	<0.008	Palladium	<0.008	Terbium	<0.008
Bismuth	0.06*	Hafnium	<0.008	Phosphorus	0.2	Thallium	<0.008
Boron	0.3	Holmium	<0.008	Platinum	<0.008	Thorium	<0.008
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	<0.008
Cadmium	0.01	Iodine	0.1	Praseodymium	<0.008	Tin	<0.008
Calcium	MC	Iridium	<0.008	Rhenium	<0.008	Titanium	0.08
Cerium	0.01	Iron	0.9	Rhodium	<0.008	Tungsten	<0.008
Cesium	<0.008	Lanthanum	0.02	Rubidium	0.2	Uranium	≤0.07
Chlorine	0.5	Lead	0.1	Ruthenium	<0.008	Vanadium	0.007
Chromium	0.01	Lithium	0.6	Samarium	<0.008	Ytterbium	<0.008
Cobalt	0.007	Lutetium	<0.008	Scandium	≤0.005	Yttrium	<0.008
Copper	0.03	Magnesium	MC	Selenium	0.04	Zinc	0.06
Dysprosium	<0.008	Manganese	0.04	Silicon	8	Zirconium	0.02
Erbium	<0.008	Mercury	NR	Silver	<0.008		
Europium	<0.008	Molybdenum	0.02	Sodium	MC		

NR - Not Reported

MC - Major Component

*Heterogeneous

TABLE F28. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #011678-B-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≈5	Neodymium	<0.002	Strontium	2
Antimony	0.004	Gadolinium	<0.002	Nickel	0.02	Sulfur	MC
Arsenic	0.1	Gallium	0.003	Niobium	0.005	Tantalum	<0.002
Barium	0.6	Germanium	≤0.02	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	0.2	Hafnium	<0.002	Phosphorus	0.04	Thallium	<0.002
Boron	0.4	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.07	Iodine	0.07	Praseodymium	<0.002	Tin	0.02
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.02
Cerium	0.004	Iron	1	Rhodium	<0.002	Tungsten	0.02
Cesium	0.01	Lanthanum	0.005	Rubidium	0.4	Uranium	0.03
Chlorine	0.1	Lead	0.3	Ruthenium	<0.002	Vanadium	0.03
Chromium	0.006	Lithium	1	Samarium	<0.002	Ytterbium	<0.002
Cobalt	≤0.003	Lutetium	<0.002	Scandium	≤0.001	Yttrium	<0.002
Copper	0.01	Magnesium	MC	Selenium	0.03	Zinc	0.1
Dysprosium	<0.002	Manganese	1	Silicon	5	Zirconium	0.005
Erbium	<0.002	Mercury	NR	Silver	0.002		
Europium	<0.002	Molybdenum	0.05	Sodium	>5		

NR - Not Reported

MC - Major Component

TABLE F29. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #021478-A-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈2	Neodymium	<0.002	Strontium	0.9
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.02	Sulfur	MC
Arsenic	0.01	Gallium	<0.002	Niobium	0.005	Tantalum	<0.002
Barium	0.1	Germanium	0.01	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.04	Thallium	<0.002
Boron	0.5	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.09	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.007	Iodine	0.05	Praseodymium	<0.002	Tin	0.009
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.03
Cerium	<0.002	Iron	2	Rhodium	<0.002	Tungsten	0.02
Cesium	0.002	Lanthanum	<0.002	Rubidium	0.08	Uranium	<0.002
Chlorine	0.3	Lead	0.09	Ruthenium	<0.002	Vanadium	0.004
Chromium	0.01	Lithium	0.1	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.002	Lutetium	<0.002	Scandium	≤0.001	Yttrium	<0.002
Copper	0.01	Magnesium	MC	Selenium	0.01	Zinc	0.03
Dysprosium	<0.002	Manganese	0.03	Silicon	8	Zirconium	<0.002
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.02	Sodium	>6		

NR - Not Reported

MC - Major Component

TABLE F30. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #021478-C-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈0.3	Neodymium	<0.001	Strontium	0.3
Antimony	0.002	Gadolinium	<0.001	Nickel	4	Sulfur	>3
Arsenic	0.4	Gallium	0.001	Niobium	0.002	Tantalum	<0.001
Barium	0.1	Germanium	0.002	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.07	Hafnium	<0.001	Phosphorus	0.03	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.03	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	0.01	Iodine	0.005	Praseodymium	<0.001	Tin	0.004
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	<0.001	Iron	MC	Rhodium	<0.001	Tungsten	0.002
Cesium	0.002	Lanthanum	0.001	Rubidium	0.03	Uranium	0.006
Chlorine	0.2	Lead	0.08	Ruthenium	<0.001	Vanadium	0.004
Chromium	0.3	Lithium	0.2	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.01	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.001
Copper	0.06	Magnesium	0.5	Selenium	0.01	Zinc	0.06
Dysprosium	<0.001	Manganese	>4	Silicon	0.3	Zirconium	0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>1		

NR - Not Reported

MC - Major Component

TABLE F31. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #021478-WS1-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.8	Neodymium	< 0.001	Strontium	0.7
Antimony	< 0.001	Gadolinium	< 0.001	Nickel	0.02	Sulfur	>3
Arsenic	0.02	Gallium	0.004	Niobium	<0.001	Tantalum	< 0.001
Barium	0.1	Germanium	0.01	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	<0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.06	Thallium	< 0.001
Boron	0.2	Holmium	<0.001	Platinum	<0.001	Thorium	< 0.001
Bromine	0.08	Indium	STD	Potassium	>5	Thulium	< 0.001
Cadmium	0.03	Iodine	0.02	Praseodymium	< 0.001	Tin	0.004
Calcium	MC	Iridium	< 0.001	Rhenium	<0.001	Titanium	0.005
Cerium	< 0.001	Iron	7	Rhodium	<0.001	Tungsten	0.01
Cesium	0.005	Lanthanum	< 0.001	Rubidium	0.05	Uranium	0.07
Chlorine	0.2	Lead	0.3	Ruthenium	< 0.001	Vanadium	0.007
Chromium	0.003	Lithium	0.02	Samarium	<0.001	Ytterbium	< 0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	< 0.001
Copper	0.06	Magnesium	4	Selenium	0.03	Zinc	0.2
Dysprosium	< 0.001	Manganese	1	Silicon	1	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.01	Sodium	>1		

NR - Not Reported

MC - Major Component

TABLE F32. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #021478-WS3-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≃2	Neodymium	<0.001	Strontium	2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.02	Sulfur	>6
Arsenic	0.004	Gallium	<0.001	Niobium	0.002	Tantalum	<0.001
Barium	0.2	Germanium	0.01	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.07	Thallium	<0.001
Boron	0.4	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.002	Iodine	0.006	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.05
Cerium	0.001	Iron	2	Rhodium	<0.001	Tungsten	0.02
Cesium	0.001	Lanthanum	<0.001	Rubidium	0.07	Uranium	0.04
Chlorine	0.2	Lead	0.08	Ruthenium	<0.001	Vanadium	0.008
Chromium	0.003	Lithium	0.3	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.05	Magnesium	MC	Selenium	0.01	Zinc	0.2
Dysprosium	<0.001	Manganese	0.05	Silicon	2	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	>3		

NR - Not Reported

MC - Major Component

TABLE F33. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #021478-WS5-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈0.2	Neodymium	<0.001	Strontium	1
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.004	Sulfur	>2
Arsenic	0.004	Gallium	0.001	Niobium	0.001	Tantalum	<0.001
Barium	0.3	Germanium	0.003	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.05	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.08	Indium	STD	Potassium	>3	Thulium	<0.001
Cadmium	0.008	Iodine	0.01	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.003
Cerium	0.001	Iron	4	Rhodium	<0.001	Tungsten	0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.01	Uranium	0.01
Chlorine	0.04	Lead	0.2	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.002	Lithium	0.04	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	0.007	Zinc	0.2
Dysprosium	<0.001	Manganese	0.09	Silicon	2	Zirconium	0.002
Erbium	<0.001	Mercury	NR	Silver	≤0.001		
Europium	<0.001	Molybdenum	0.006	Sodium	>0.7		

NR - Not Reported

MC - Major Component

TABLE F34. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #021478-WS8-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈0.4	Neodymium	<0.001	Strontium	3
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.005	Sulfur	>2
Arsenic	0.002	Gallium	0.001	Niobium	<0.001	Tantalum	≤0.002
Barium	0.3	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	≤0.002	Hafnium	<0.001	Phosphorus	0.05	Thallium	<0.001
Boron	0.006	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	>4	Thulium	<0.001
Cadmium	0.02	Iodine	0.001	Praseodymium	≤0.002	Tin	0.003
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.008
Cerium	0.002	Iron	3	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.001	Rubidium	0.003	Uranium	0.05
Chlorine	0.07	Lead	0.1	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.002	Lithium	0.02	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.005	Magnesium	MC	Selenium	0.008	Zinc	0.08
Dysprosium	<0.001	Manganese	0.2	Silicon	0.7	Zirconium	<0.001
Erbium	<0.001	Mercury	NR	Silver	≤0.001		
Europium	<0.001	Molybdenum	0.003	Sodium	>0.8		

NR - Not Reported

MC - Major Component

TABLE F35. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #041078-A-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	2	Fluorine	0.6	Neodymium	< 0.002	Strontium	1
Antimony	< 0.002	Gadolinium	< 0.002	Nickel	0.02	Sulfur	MC
Arsenic	0.01	Gallium	0.002	Niobium	≤ 0.005	Tantalum	< 0.002
Barium	0.2	Germanium	≤ 0.01	Osmium	< 0.002	Tellurium	< 0.002
Beryllium	< 0.002	Gold	< 0.002	Palladium	< 0.002	Terbium	< 0.002
Bismuth	< 0.002	Hafnium	< 0.002	Phosphorus	0.1	Thallium	< 0.002
Boron	0.3	Holmium	< 0.002	Platinum	< 0.002	Thorium	< 0.002
Bromine	0.07	Indium	STD	Potassium	MC	Thulium	< 0.002
Cadmium	< 0.002	Iodine	0.02	Praseodymium	< 0.002	Tin	< 0.002
Calcium	MC	Iridium	< 0.002	Rhenium	< 0.002	Titanium	0.06
Cerium	< 0.002	Iron	1	Rhodium	< 0.002	Tungsten	< 0.002
Cesium	0.002	Lanthanum	< 0.002	Rubidium	0.07	Uranium	< 0.002
Chlorine	0.3	Lead	0.03	Ruthenium	< 0.002	Vanadium	0.004
Chromium	0.006	Lithium	0.1	Samarium	< 0.002	Ytterbium	< 0.002
Cobalt	0.002	Lutetium	< 0.002	Scandium	≤ 0.002	Yttrium	0.003
Copper	0.03	Magnesium	9	Selenium	0.01	Zinc	0.03
Dysprosium	< 0.002	Manganese	0.03	Silicon	MC	Zirconium	0.03
Erbium	< 0.002	Mercury	NR	Silver	< 0.002		
Europium	< 0.002	Molybdenum	0.01	Sodium	5		

NR - Not Reported
MC - Major component

TABLE F36. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #04178-B-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.4	Fluorine	≈0.6	Neodymium	<0.008	Strontium	0.6
Antimony	<0.008	Gadolinium	<0.008	Nickel	0.07	Sulfur	MC
Arsenic	0.08	Gallium	0.007	Niobium	<0.008	Tantalum	<0.008
Barium	0.2	Germanium	<0.008	Osmium	<0.008	Tellurium	<0.008
Beryllium	<0.008	Gold	<0.008	Palladium	<0.008	Terbium	<0.008
Bismuth	0.2	Hafnium	<0.008	Phosphorus	0.1	Thallium	<0.008
Boron	0.6	Holmium	<0.008	Platinum	<0.008	Thorium	<0.008
Bromine	0.8	Indium	STD	Potassium	MC	Thulium	<0.008
Cadmium	0.03	Iodine	0.2	Praseodymium	<0.008	Tin	0.06
Calcium	MC	Iridium	<0.008	Rhenium	<0.008	Titanium	0.2
Cerium	<0.008	Iron	9	Rhodium	<0.008	Tungsten	<0.008
Cesium	0.01	Lanthanum	<0.008	Rubidium	0.3	Uranium	<0.008
Chlorine	1	Lead	0.2	Ruthenium	<0.008	Vanadium	0.05
Chromium	0.05	Lithium	0.3	Samarium	<0.008	Ytterbium	<0.008
Cobalt	0.007	Lutetium	<0.008	Scandium	≤0.01	Yttrium	<0.008
Copper	0.3	Magnesium	2	Selenium	0.09	Zinc	0.1
Dysprosium	<0.008	Manganese	2	Silicon	3	Zirconium	0.04
Erbium	<0.008	Mercury	NR	Silver	<0.008		
Europium	<0.008	Molybdenum	0.1	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE F37. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #041178-WS1-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.07	Fluorine	≈3	Neodymium	<0.001	Strontium	0.8
Antimony	0.07	Gadolinium	<0.001	Nickel	0.009	Sulfur	>7
Arsenic	0.05	Gallium	0.002	Niobium	0.001	Tantalum	<0.001
Barium	0.2	Germanium	0.02	Osmium	<0.001	Tellurium	≤0.04
Beryllium	<0.001	Gold	0.01	Palladium	<0.001	Terbium	<0.001
Bismuth	0.02	Hafnium	<0.001	Phosphorus	0.07	Thallium	<0.001
Boron	0.4	Holmium	<0.001	Platinum	<0.001	Thorium	0.1
Bromine	0.4	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.004	Iodine	0.04	Praseodymium	0.001	Tin	0.04
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.1
Cerium	0.002	Iron	3	Rhodium	<0.001	Tungsten	0.02
Cesium	0.006	Lanthanum	0.004	Rubidium	0.09	Uranium	<0.001
Chlorine	0.1	Lead	0.2	Ruthenium	<0.001	Vanadium	0.02
Chromium	0.05	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.004	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.007
Copper	0.04	Magnesium	5	Selenium	0.01	Zinc	0.1
Dysprosium	<0.001	Manganese	0.1	Silicon	MC	Zirconium	0.03
Erbium	<0.001	Mercury	NR	Silver	0.002		
Europium	<0.001	Molybdenum	0.01	Sodium	>3		

NR - Not Reported

MC - Major Component

TABLE F38. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #041078-WS3-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.6	Fluorine	≈2	Neodymium	<0.004	Strontium	2
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.04	Sulfur	MC
Arsenic	0.005	Gallium	0.004	Niobium	0.006	Tantalum	<0.004
Barium	0.2	Germanium	≤0.01	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.3	Thallium	<0.004
Boron	0.5	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	<0.004	Iodine	0.02	Praseodymium	<0.004	Tin	0.02
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.2
Cerium	0.02	Iron	MC	Rhodium	<0.004	Tungsten	0.05
Cesium	0.002	Lanthanum	0.01	Rubidium	0.1	Uranium	≤0.03
Chlorine	0.5	Lead	0.1	Ruthenium	<0.004	Vanadium	0.008
Chromium	0.01	Lithium	0.2	Samarium	<0.004	Ytterbium	<0.004
Cobalt	0.008	Lutetium	<0.004	Scandium	≤0.006	Yttrium	0.007
Copper	0.1	Magnesium	MC	Selenium	0.01	Zinc	0.3
Dysprosium	<0.004	Manganese	0.1	Silicon	MC	Zirconium	0.01
Erbium	<0.004	Mercury	NR	Silver	0.02		
Europium	<0.004	Molybdenum	0.05	Sodium	MC		

NR - Not Reported
MC - Major Component

TABLE F39. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #041078-WS5-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.06	Fluorine	≃2	Neodymium	<0.003	Strontium	2
Antimony	<0.003	Gadolinium	<0.003	Nickel	0.04	Sulfur	MC
Arsenic	0.01	Gallium	0.002	Niobium	<0.003	Tantalum	<0.003
Barium	0.2	Germanium	≤0.005	Osmium	<0.003	Tellurium	<0.003
Beryllium	<0.003	Gold	<0.003	Palladium	<0.003	Terbium	<0.003
Bismuth	<0.003	Hafnium	<0.003	Phosphorus	0.1	Thallium	<0.003
Boron	0.05	Holmium	<0.003	Platinum	<0.003	Thorium	<0.003
Bromine	0.05	Indium	STD	Potassium	MC	Thulium	<0.003
Cadmium	<0.003	Iodine	0.02	Praseodymium	<0.003	Tin	<0.003
Calcium	MC	Iridium	<0.003	Rhenium	<0.003	Titanium	0.04
Cerium	0.003	Iron	MC	Rhodium	<0.003	Tungsten	<0.003
Cesium	<0.003	Lanthanum	<0.003	Rubidium	0.2	Uranium	<0.003
Chlorine	0.4	Lead	0.09	Ruthenium	<0.003	Vanadium	0.004
Chromium	0.006	Lithium	0.1	Samarium	<0.003	Ytterbium	<0.003
Cobalt	0.002	Lutetium	<0.003	Scandium	≤0.003	Yttrium	0.008
Copper	0.03	Magnesium	MC	Selenium	0.007	Zinc	0.2
Dysprosium	<0.003	Manganese	0.2	Silicon	3	Zirconium	0.02
Erbium	<0.003	Mercury	NR	Silver	<0.003		
Europium	<0.003	Molybdenum	0.2*	Sodium	>6		

NR - Not Reported
MC - Major Component
*Heterogeneous

TABLE F40. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #041078-WS8-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.7	Fluorine	≈0.5	Neodymium	<0.001	Strontium	2
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.006	Sulfur	>4
Arsenic	0.003	Gallium	0.001	Niobium	0.01	Tantalum	<0.001
Barium	0.6	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.001	Hafnium	<0.001	Phosphorus	0.1	Thallium	<0.001
Boron	0.06	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.01
Bromine	0.07	Indium	STD	Potassium	>7	Thulium	<0.001
Cadmium	<0.001	Iodine	0.002	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.03
Cerium	0.001	Iron	1	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.004	Lanthanum	0.001	Rubidium	0.01	Uranium	≤0.01
Chlorine	0.1	Lead	0.1	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.007	Lithium	0.04	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	MC	Selenium	0.004	Zinc	0.09
Dysprosium	<0.001	Manganese	0.1	Silicon	2	Zirconium	0.02
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.009	Sodium	>2		

NR - Not Reported

MC - Major component

TABLE F41. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #061378-A-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.09	Fluorine	≈2	Neodymium	<0.002	Strontium	1
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.02	Sulfur	MC
Arsenic	0.004	Gallium	0.002	Niobium	<0.002	Tantalum	<0.002
Barium	0.1	Germanium	0.01	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.09	Thallium	<0.002
Boron	0.2	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.005	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.004	Iodine	0.004	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.05
Cerium	0.004	Iron	0.4	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	0.006	Rubidium	0.05	Uranium	≤0.02
Chlorine	0.1	Lead	0.09	Ruthenium	<0.002	Vanadium	0.004
Chromium	≤0.05	Lithium	0.1	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.003	Lutetium	<0.002	Scandium	≤0.002	Yttrium	≤0.007
Copper	0.006	Magnesium	10	Selenium	≤0.1	Zinc	0.03
Dysprosium	<0.002	Manganese	0.01	Silicon	MC	Zirconium	≤0.06
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.02	Sodium	>5		

NR - Not Reported
MC - Major Component

TABLE F42. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #061378-WS1-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈ 0.8	Neodymium	< 0.001	Strontium	0.6
Antimony	0.002	Gadolinium	< 0.001	Nickel	0.03	Sulfur	> 6
Arsenic	0.009	Gallium	0.001	Niobium	0.002	Tantalum	< 0.001
Barium	0.3	Germanium	0.02	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.07	Thallium	< 0.001
Boron	0.1	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.08	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	0.006	Iodine	0.01	Praseodymium	< 0.001	Tin	* 0.007
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	0.07
Cerium	< 0.001	Iron	2	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	< 0.001	Lanthanum	< 0.001	Rubidium	0.03	Uranium	≤ 0.01
Chlorine	0.2	Lead	0.1	Ruthenium	< 0.001	Vanadium	0.003
Chromium	≤ 0.02	Lithium	0.1	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	≤ 0.001	Lutetium	< 0.001	Scandium	≤ 0.001	Yttrium	≤ 0.006
Copper	0.01	Magnesium	1	Selenium	0.01	Zinc	0.05
Dysprosium	< 0.001	Manganese	0.04	Silicon	1	Zirconium	≤ 0.02
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.007	Sodium	> 3		

NR - Not Reported
MC - Major Component
*Heterogeneous

TABLE F43. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #061378-WS2-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≃ 0.7	Neodymium	< 0.001	Strontium	0.7
Antimony	0.06	Gadolinium	< 0.001	Nickel	0.04	Sulfur	> 6
Arsenic	0.09	Gallium	0.003	Niobium	0.001	Tantalum	< 0.001
Barium	0.1	Germanium	0.02	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.2	Thallium	< 0.001
Boron	0.2	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	0.007	Iodine	0.004	Praseodymium	< 0.001	Tin	0.004
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	≤ 0.02
Cerium	0.003	Iron	3	Rhodium	< 0.001	Tungsten	0.01
Cesium	0.001	Lanthanum	0.002	Rubidium	0.09	Uranium	0.04
Chlorine	0.1	Lead	0.4	Ruthenium	< 0.001	Vanadium	0.006
Chromium	0.05	Lithium	0.4	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	≤ 0.002	Lutetium	< 0.001	Scandium	≤ 0.001	Yttrium	≤ 0.007
Copper	0.03	Magnesium	MC	Selenium	0.01	Zinc	0.5
Dysprosium	< 0.001	Manganese	0.03	Silicon	2	Zirconium	≤ 0.01
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.007	Sodium	> 3		

NR - Not Reported
MC - Major Component

TABLE F44. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #061378-WS5-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.5	Fluorine	≈0.3	Neodymium	<0.002	Strontium	1
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.06	Sulfur	>9
Arsenic	0.007	Gallium	0.002	Niobium	0.002	Tantalum	<0.002
Barium	0.6	Germanium	0.01	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	0.2	Thallium	<0.002
Boron	0.3	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	0.01	Iodine	0.03	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.03
Cerium	0.003	Iron	8	Rhodium	0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	0.003	Rubidium	0.05	Uranium	0.02
Chlorine	0.2	Lead	0.1	Ruthenium	<0.002	Vanadium	0.003
Chromium	0.05	Lithium	0.09	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.004	Lutetium	<0.002	Scandium	≤0.002	Yttrium	≤0.009
Copper	0.03	Magnesium	5	Selenium	0.02	Zinc	*0.6
Dysprosium	<0.002	Manganese	0.2	Silicon	2	Zirconium	≤0.02
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.04	Sodium	>4		

NR - Not Reported
MC - Major Component
*Heterogeneous

TABLE F45. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #061378-WS56-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≃ 0.7	Neodymium	< 0.001	Strontium	3
Antimony	0.007	Gadolinium	< 0.001	Nickel	0.03	Sulfur	> 6
Arsenic	0.07	Gallium	0.001	Niobium	0.002	Tantalum	< 0.001
Barium	0.2	Germanium	0.04	Osmium	< 0.001	Tellurium	< 0.001
Beryllium	< 0.001	Gold	< 0.001	Palladium	< 0.001	Terbium	< 0.001
Bismuth	< 0.001	Hafnium	< 0.001	Phosphorus	0.3	Thallium	< 0.001
Boron	0.07	Holmium	< 0.001	Platinum	< 0.001	Thorium	< 0.001
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	< 0.001
Cadmium	0.007	Iodine	0.03	Praseodymium	< 0.001	Tin	< 0.001
Calcium	MC	Iridium	< 0.001	Rhenium	< 0.001	Titanium	≤ 0.02
Cerium	0.002	Iron	9	Rhodium	< 0.001	Tungsten	< 0.001
Cesium	< 0.001	Lanthanum	0.002	Rubidium	0.006	Uranium	0.06
Chlorine	0.4	Lead	0.4	Ruthenium	< 0.001	Vanadium	0.007
Chromium	0.03	Lithium	0.06	Samarium	< 0.001	Ytterbium	< 0.001
Cobalt	0.005	Lutetium	< 0.001	Scandium	≤ 0.001	Yttrium	≤ 0.006
Copper	0.03	Magnesium	MC	Selenium	0.03	Zinc	0.5
Dysprosium	< 0.001	Manganese	0.2	Silicon	MC	Zirconium	0.003
Erbium	< 0.001	Mercury	NR	Silver	< 0.001		
Europium	< 0.001	Molybdenum	0.01	Sodium	> 3		

NR - Not Reported
MC - Major Component

TABLE F46. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #061378-WS8-L.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.02	Fluorine	≃ 0.2	Neodymium	<0.002	Strontium	1
Antimony	<0.002	Gadolinium	< 0.002	Nickel	0.009	Sulfur	MC
Arsenic	0.004	Gallium	0.002	Niobium	<0.002	Tantalum	< 0.002
Barium	0.2	Germanium	< 0.002	Osmium	<0.002	Tellurium	< 0.002
Beryllium	<0.002	Gold	< 0.002	Palladium	<0.002	Terbium	< 0.002
Bismuth	<0.002	Hafnium	< 0.002	Phosphorus	0.09	Thallium	< 0.002
Boron	0.002	Holmium	< 0.002	Platinum	<0.002	Thorium	< 0.002
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	< 0.002
Cadmium	0.004	Iodine	0.007	Praseodymium	< 0.002	Tin	< 0.002
Calcium	MC	Iridium	< 0.002	Rhenium	<0.002	Titanium	≤ 0.01
Cerium	<0.002	Iron	2	Rhodium	< 0.002	Tungsten	< 0.002
Cesium	<0.002	Lanthanum	< 0.002	Rubidium	0.002	Uranium	≤ 0.02
Chlorine	0.3	Lead	0.03	Ruthenium	<0.002	Vanadium	0.001
Chromium	0.003	Lithium	0.04	Samarium	<0.002	Ytterbium	< 0.002
Cobalt	<0.001	Lutetium	< 0.002	Scandium	<0.003	Yttrium	≤ 0.003
Copper	0.006	Magnesium	8	Selenium	≤0.01	Zinc	0.03
Dysprosium	< 0.002	Manganese	0.09	Silicon	3	Zirconium	≤ 0.006
Erbium	< 0.002	Mercury	NR	Silver	< 0.002		
Europium	< 0.002	Molybdenum	0.01	Sodium	> 6		

MC - Major Component
NR - Not Reported

TABLE F47. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #092178-WS-1.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈0.9	Neodymium	<0.005	Strontium	0.2
Antimony	<0.005	Gadolinium	<0.005	Nickel	0.04	Sulfur	MC
Arsenic	0.005	Gallium	<0.005	Niobium	<0.005	Tantalum	<0.005
Barium	0.06	Germanium	<0.005	Osmium	<0.005	Tellurium	<0.005
Beryllium	<0.005	Gold	<0.005	Palladium	<0.005	Terbium	<0.005
Bismuth	<0.005	Hafnium	<0.005	Phosphorus	0.04	Thallium	<0.005
Boron	1	Holmium	<0.005	Platinum	<0.005	Thorium	<0.005
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.005
Cadmium	<0.005	Iodine	0.01	Praseodymium	<0.005	Tin	<0.005
Calcium	MC	Iridium	<0.005	Rhenium	<0.005	Titanium	0.1
Cerium	<0.005	Iron	0.6	Rhodium	<0.005	Tungsten	<0.005
Cesium	<0.005	Lanthanum	<0.005	Rubidium	0.05	Uranium	<0.005
Chlorine	0.3	Lead	0.1	Ruthenium	<0.005	Vanadium	0.001
Chromium	≤0.001	Lithium	0.2	Samarium	<0.005	Ytterbium	<0.005
Cobalt	≤0.009	Lutetium	<0.005	Scandium	≤0.007	Yttrium	<0.005
Copper	0.03	Magnesium	2	Selenium	≤0.008	Zinc	0.2
Dysprosium	<0.005	Manganese	0.03	Silicon	9	Zirconium	0.09
Erbium	<0.005	Mercury	NR	Silver	<0.005		
Europium	<0.005	Molybdenum	0.03	Sodium	MC		

NR - Not Reported
MC - Major Component

TABLE F48. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #092178-WS-3.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.05	Fluorine	≈2	Neodymium	<0.004	Strontium	0.7
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.02	Sulfur	MC
Arsenic	0.004	Gallium	≤0.03	Niobium	<0.004	Tantalum	<0.004
Barium	0.05	Germanium	0.01	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.08	Thallium	<0.004
Boron	0.4	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.08	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	<0.004	Iodine	0.009	Praseodymium	<0.004	Tin	<0.004
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.01
Cerium	<0.004	Iron	1	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	<0.004	Rubidium	0.08	Uranium	<0.004
Chlorine	0.3	Lead	<0.004	Ruthenium	<0.004	Vanadium	<0.001
Chromium	≤0.001	Lithium	0.1	Samarium	<0.004	Ytterbium	<0.004
Cobalt	≤0.007	Lutetium	<0.004	Scandium	≤0.005	Yttrium	<0.004
Copper	0.02	Magnesium	MC	Selenium	≤0.007	Zinc	0.07
Dysprosium	<0.004	Manganese	0.06	Silicon	4	Zirconium	0.01
Erbium	<0.004	Mercury	NR	Silver	<0.004		
Europium	<0.004	Molybdenum	0.05	Sodium	MC		

STD - Internal Standard
NR - Not Reported
MC - Major Component
INT - Interference

TABLE F49. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #092178-WS-5.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.1	Fluorine	≈2	Neodymium	<0.006	Strontium	3
Antimony	<0.006	Gadolinium	<0.006	Nickel	0.2	Sulfur	MC
Arsenic	0.01	Gallium	0.2	Niobium	<0.006	Tantalum	<0.006
Barium	0.3	Germanium	<0.006	Osmium	<0.006	Tellurium	<0.006
Beryllium	<0.006	Gold	<0.006	Palladium	<0.006	Terbium	<0.006
Bismuth	<0.006	Hafnium	<0.006	Phosphorus	0.3	Thallium	<0.006
Boron	0.1	Holmium	<0.006	Platinum	<0.006	Thorium	<0.006
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.006
Cadmium	<0.006	Iodine	0.01	Praseodymium	<0.006	Tin	<0.006
Calcium	MC	Iridium	<0.006	Rhenium	<0.006	Titanium	0.05
Cerium	<0.006	Iron	MC	Rhodium	<0.006	Tungsten	<0.006
Cesium	<0.006	Lanthanum	<0.006	Rubidium	0.01	Uranium	<0.006
Chlorine	2	Lead	0.03	Ruthenium	<0.006	Vanadium	≤0.001
Chromium	0.005	Lithium	0.2	Samarium	<0.006	Ytterbium	<0.006
Cobalt	0.003	Lutetium	<0.006	Scandium	≤0.007	Yttrium	≤0.005
Copper	0.04	Magnesium	MC	Selenium	0.02	Zinc	0.2
Dysprosium	<0.006	Manganese	0.1	Silicon	5	Zirconium	<0.006
Erbium	<0.006	Mercury	NR	Silver	<0.006		
Europium	<0.006	Molybdenum	≤0.07	Sodium	16		

STD - Internal Standard
NR - Not Reported
MC - Major Component
INT - Interference

TABLE F50. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #092178-WS-6.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≃2	Neodymium	<0.004	Strontium	0.7
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.02	Sulfur	MC
Arsenic	0.02	Gallium	0.07	Niobium	<0.004	Tantalum	<0.004
Barium	*0.5	Germanium	0.03	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.3	Thallium	<0.004
Boron	0.4	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.08	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	<0.004	Iodine	0.02	Praseodymium	<0.004	Tin	<0.004
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.1
Cerium	<0.004	Iron	MC	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	<0.004	Rubidium	0.04	Uranium	<0.004
Chlorine	0.2	Lead	0.2	Ruthenium	<0.004	Vanadium	0.007
Chromium	0.005	Lithium	0.03	Samarium	<0.004	Ytterbium	<0.004
Cobalt	≤0.007	Lutetium	<0.004	Scandium	≤0.005	Yttrium	<0.004
Copper	0.01	Magnesium	21	Selenium	≤0.01	Zinc	0.1
Dysprosium	<0.004	Manganese	0.1	Silicon	7	Zirconium	0.007
Erbium	<0.004	Mercury	NR	Silver	<0.004		
Europium	<0.004	Molybdenum	0.01	Sodium	MC		

STD - Internal Standard
NR - Not Reported
MC - Major Component
INT - Interference

TABLE F51. SSMS DATA FOR LAWRENCE LIVERMORE SAMPLE #092178-WS-8.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.2	Fluorine	≃2	Neodymium	<0.004	Strontium	2
Antimony	<0.004	Gadolinium	<0.004	Nickel	0.1	Sulfur	MC
Arsenic	0.02	Gallium	0.1	Niobium	≤0.006	Tantalum	<0.004
Barium	0.5	Germanium	≤0.02	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	0.3	Thallium	<0.004
Boron	0.4	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.2	Indium	STD	Potassium	MC	Thulium	<0.004
Cadmium	<0.004	Iodine	<0.004	Praseodymium	<0.004	Tin	<0.004
Calcium	MC	Iridium	<0.004	Rhenium	<0.004	Titanium	0.1
Cerium	<0.004	Iron	MC	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	<0.004	Rubidium	0.01	Uranium	<0.004
Chlorine	0.1	Lead	0.2	Ruthenium	<0.004	Vanadium	0.002
Chromium	≤0.001	Lithium	0.3	Samarium	<0.004	Ytterbium	<0.004
Cobalt	≤0.007	Lutetium	<0.004	Scandium	≤0.005	Yttrium	≤0.01
Copper	0.03	Magnesium	MC	Selenium	≤0.007	Zinc	0.07
Dysprosium	<0.004	Manganese	0.6	Silicon	MC	Zirconium	≤0.006
Erbium	<0.004	Mercury	NR	Silver	<0.004		
Europium	<0.004	Molybdenum	<0.004	Sodium	MC		

STD - Internal Standard
NR - Not Reported
MC - Major Component
INT - Interference

TABLE F52. SSMS DATA FOR SAMPLE 1977-UCG-003.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.4	Fluorine	≈0.6	Neodymium	0.001	Strontium	0.2
Antimony	0.003	Gadolinium	<0.001	Nickel	0.004	Sulfur	MC
Arsenic	0.04	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.09	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	MC	Thallium	<0.001
Boron	0.009	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.4	Indium	STD	Potassium	>5	Thulium	<0.001
Cadmium	<0.001	Iodine	0.007	Praseodymium	<0.001	Tin	0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.05
Cerium	0.002	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.002	Rubidium	0.005	Uranium	0.02
Chlorine	0.6	Lead	0.04	Ruthenium	<0.001	Vanadium	0.003
Chromium	0.005	Lithium	0.1	Samarium	<0.001	Ytterbium	<0.001
Cobalt	<0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	<0.001
Copper	0.03	Magnesium	MC	Selenium	0.01	Zinc	0.1
Dysprosium	<0.001	Manganese	0.03	Silicon	MC	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	>1		

NR-Not Reported

MC-Major Component

TABLE F53. SSMS DATA FOR SAMPLE 1977-UCG-006.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈3	Neodymium	0.003	Strontium	2
Antimony	0.9	Gadolinium	<0.001	Nickel	0.1	Sulfur	MC
Arsenic	0.02	Gallium	0.008	Niobium	0.006	Tantalum	<0.001
Barium	0.2	Germanium	0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	0.02	Palladium	<0.001	Terbium	<0.001
Bismuth	0.003	Hafnium	<0.001	Phosphorus	5	Thallium	<0.001
Boron	0.04	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.01
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.004	Iodine	0.002	Praseodymium	0.002	Tin	0.005
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	1
Cerium	0.01	Iron	MC	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.002	Lanthanum	0.01	Rubidium	0.02	Uranium	≤0.008
Chlorine	1	Lead	0.2	Ruthenium	<0.001	Vanadium	0.03
Chromium	0.06	Lithium	0.06	Samarium	0.005	Ytterbium	<0.001
Cobalt	≤0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	0.004
Copper	0.2	Magnesium	MC	Selenium	≤0.01	Zinc	0.2
Dysprosium	<0.001	Manganese	1	Silicon	MC	Zirconium	0.02
Erbium	<0.001	Mercury	NR	Silver	0.5		
Europium	0.001	Molybdenum	0.01	Sodium	>3		

NR-Not Reported

MC-Major Component

TABLE F54. SSMS DATA FOR SAMPLE 1977-UCG-009.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>2	Fluorine	≈0.6	Neodymium	<0.001	Strontium	0.5
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.05	Sulfur	MC
Arsenic	0.007	Gallium	0.001	Niobium	0.008	Tantalum	<0.001
Barium	0.1	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	MC	Thallium	<0.001
Boron	0.03	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.01
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.003	Iodine	0.03	Praseodymium	<0.001	Tin	0.004
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.08
Cerium	0.002	Iron	2	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.05	Lanthanum	≤0.003	Rubidium	0.03	Uranium	≤0.01
Chlorine	0.9	Lead	0.2	Ruthenium	<0.001	Vanadium	0.1
Chromium	0.02	Lithium	0.05	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.001	Lutetium	<0.001	Scandium	<0.001	Yttrium	0.005
Copper	0.04	Magnesium	3	Selenium	≤0.004	Zinc	0.1
Dysprosium	<0.001	Manganese	0.03	Silicon	2	Zirconium	0.005
Erbium	<0.001	Mercury	NR	Silver	0.1		
Europium	<0.001	Molybdenum	0.04	Sodium	>4		

NR-Not Reported

MC-Major Component

TABLE F55. SSMS DATA FOR SAMPLE 1977-UCG-012.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>0.9	Fluorine	≃1	Neodymium	0.003	Strontium	0.7
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.03	Sulfur	MC
Arsenic	0.004	Gallium	0.003	Niobium	0.002	Tantalum	<0.001
Barium	0.05	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	4	Thallium	≤0.004
Boron	0.04	Holmium	<0.001	Platinum	≤0.004	Thorium	0.02
Bromine	0.02	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	0.002	Iodine	0.003	Praseodymium	0.001	Tin	0.006
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.05
Cerium	0.004	Iron	5	Rhodium	<0.001	Tungsten	<0.001
Cesium	0.01	Lanthanum	0.004	Rubidium	0.004	Uranium	0.01
Chlorine	0.1	Lead	0.08	Ruthenium	<0.001	Vanadium	0.2
Chromium	0.01	Lithium	0.09	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.003	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.01	Magnesium	MC	Selenium	0.003	Zinc	0.1
Dysprosium	<0.001	Manganese	0.1	Silicon	7	Zirconium	0.006
Erbium	<0.001	Mercury	NR	Silver	0.004		
Europium	<0.001	Molybdenum	0.01	Sodium	>2		

NR-Not Reported

MC-Major Component

TABLE F56. SSMS DATA FOR SAMPLE 1977-UCG-015 (BLANK).

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.03	Fluorine	≈0.4	Neodymium	<0.002	Strontium	0.09
Antimony	<0.002	Gadolinium	<0.002	Nickel	0.02	Sulfur	0.09
Arsenic	0.009	Gallium	≤0.002	Niobium	<0.002	Tantalum	<0.002
Barium	0.05	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	9	Thallium	<0.002
Boron	0.002	Holmium	<0.002	Platinum	<0.002	Thorium	≤0.02
Bromine	0.01	Indium	STD	Potassium	3	Thulium	<0.002
Cadmium	<0.002	Iodine	0.002	Praseodymium	<0.002	Tin	<0.002
Calcium	4	Iridium	<0.002	Rhenium	<0.002	Titanium	0.01
Cerium	<0.002	Iron	0.1	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	<0.002	Rubidium	0.005	Uranium	≤0.02
Chlorine	0.3	Lead	0.02	Ruthenium	<0.002	Vanadium	0.004
Chromium	0.03	Lithium	0.008	Samarium	<0.002	Ytterbium	<0.002
Cobalt	0.02	Lutetium	<0.002	Scandium	<0.001	Yttrium	<0.002
Copper	0.02	Magnesium	0.3	Selenium	<0.002	Zinc	0.1
Dysprosium	<0.002	Manganese	0.01	Silicon	0.5	Zirconium	0.01
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.06	Sodium	≥6		

NR-Not Reported

TABLE F57. SSMS DATA FOR SAMPLE 1977-UCG-018.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>1	Fluorine	≈0.2	Neodymium	≤0.003	Strontium	0.08
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.03	Sulfur	>7
Arsenic	0.04	Gallium	0.3	Niobium	<0.001	Tantalum	<0.001
Barium	0.3	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	MC	Thallium	<0.001
Boron	0.1	Holmium	<0.001	Platinum	<0.001	Thorium	≤0.001
Bromine	≤0.02	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	≤0.003	Iodine	0.002	Praseodymium	0.001	Tin	0.01
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.1
Cerium	0.003	Iron	3	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.005	Rubidium	0.009	Uranium	≤0.009
Chlorine	0.1	Lead	0.01	Ruthenium	<0.001	Vanadium	0.02
Chromium	0.05	Lithium	3	Samarium	<0.001	Ytterbium	<0.001
Cobalt	0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	≤0.002
Copper	0.1	Magnesium	MC	Selenium	≤0.01	Zinc	0.05
Dysprosium	<0.001	Manganese	0.05	Silicon	MC	Zirconium	0.007
Erbium	<0.001	Mercury	NR	Silver	≤0.002		
Europium	<0.001	Molybdenum	0.008	Sodium	>3		

NR-Not Reported

Sample was ashed at 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

TABLE F58. SSMS DATA FOR SAMPLE 1977-UCG-021.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>2	Fluorine	≈0.2	Neodymium	≤0.007	Strontium	0.1
Antimony	0.08	Gadolinium	<0.002	Nickel	0.1	Sulfur	MC
Arsenic	0.2	Gallium	0.2	Niobium	≤0.003	Tantalum	<0.002
Barium	0.1	Germanium	≤0.005	Osmium	<0.002	Tellurium	≤0.004
Beryllium	0.001	Gold	<0.002	Palladium	<0.002	Terbium	0.003
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	MC	Thallium	<0.002
Boron	1	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.05	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	≤0.004	Iodine	≤0.003	Praseodymium	0.003	Tin	0.02
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	0.1
Cerium	0.006	Iron	2	Rhodium	<0.002	Tungsten	<0.002
Cesium	≤0.001	Lanthanum	0.01	Rubidium	0.004	Uranium	<0.002
Chlorine	9	Lead	0.01	Ruthenium	<0.002	Vanadium	0.02
Chromium	0.5	Lithium	7	Samarium	0.01	Ytterbium	<0.002
Cobalt	0.002	Lutetium	<0.002	Scandium	≤0.003	Yttrium	0.003
Copper	0.3	Magnesium	MC	Selenium	0.4	Zinc	0.2
Dysprosium	<0.002	Manganese	0.1	Silicon	MC	Zirconium	0.007
Erbium	<0.002	Mercury	NR	Silver	≤0.002		
Europium	0.003	Molybdenum	0.03	Sodium	>6		

NR-Not Reported

Sample was ashed @ 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

MC-Major Component

TABLE F59. SSMS DATA FOR LERC SAMPLE #UCG-022.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>10	Fluorine	≈15	Neodymium	0.05	Strontium	0.3
Antimony	0.2	Gadolinium	0.02	Nickel	0.4	Sulfur	≥61
Arsenic	2	Gallium	0.8	Niobium	0.05	Tantalum	<0.01
Barium	2	Germanium	0.06	Osmium	<0.01	Tellurium	≤0.03
Beryllium	<0.01	Gold	<0.01	Palladium	<0.01	Terbium	<0.01
Bismuth	0.3	Hafnium	<0.01	Phosphorus	14	Thallium	<0.01
Boron	0.2	Holmium	<0.01	Platinum	<0.01	Thorium	0.1
Bromine	0.09	Indium	STD	Potassium	MC	Thulium	<0.01
Cadmium	0.07	Iodine	0.02	Praseodymium	0.02	Tin	0.9
Calcium	MC	Iridium	<0.01	Rhenium	<0.01	Titanium	5
Cerium	0.3	Iron	MC	Rhodium	<0.01	Tungsten	<0.01
Cesium	0.04	Lanthanum	0.1	Rubidium	0.09	Uranium	0.09
Chlorine	*42	Lead	8	Ruthenium	<0.01	Vanadium	0.6
Chromium	3	Lithium	0.03	Samarium	0.09	Ytterbium	<0.01
Cobalt	0.2	Lutetium	<0.01	Scandium	0.06	Yttrium	0.08
Copper	53	Magnesium	45	Selenium	0.3	Zinc	6
Dysprosium	<0.01	Manganese	0.5	Silicon	MC	Zirconium	0.3
Erbium	<0.01	Mercury	NR	Silver	*0.4		
Europium	≤0.01	Molybdenum	0.1	Sodium	≥25		

NR - Not Reported

MC - Major Component - element greater than 100 ppm - Sample was ashed @ 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

TABLE F60. SSMS DATA FOR LERC SAMPLE #UCG-023.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>14	Fluorine	≈40	Neodymium	0.03	Strontium	0.6
Antimony	0.7	Gadolinium	<0.02	Nickel	2	Sulfur	≥87
Arsenic	12	Gallium	0.9	Niobium	0.07	Tantalum	<0.02
Barium	3	Germanium	0.1	Osmium	<0.02	Tellurium	≤0.04
Beryllium	<0.02	Gold	<0.02	Palladium	<0.02	Terbium	<0.02
Bismuth	0.2	Hafnium	<0.02	Phosphorus	8	Thallium	≤0.04
Boron	0.06	Holmium	<0.02	Platinum	<0.02	Thorium	<0.02
Bromine	0.1	Indium	STD	Potassium	87	Thulium	<0.02
Cadmium	0.05	Iodine	0.07	Praseodymium	0.03	Tin	1
Calcium	MC	Iridium	<0.02	Rhenium	<0.02	Titanium	4
Cerium	0.8	Iron	76	Rhodium	<0.02	Tungsten	<0.02
Cesium	0.05	Lanthanum	0.6	Rubidium	0.2	Uranium	≤0.1
Chlorine	0.8	Lead	5	Ruthenium	<0.02	Vanadium	0.2
Chromium	7	Lithium	0.04	Samarium	0.07	Ytterbium	<0.02
Cobalt	0.1	Lutetium	<0.02	Scandium	≤0.02	Yttrium	0.1
Copper	63	Magnesium	21	Selenium	0.4	Zinc	21
Dysprosium	<0.02	Manganese	2	Silicon	MC	Zirconium	0.4
Erbium	<0.02	Mercury	NR	Silver	1		
Europium	<0.02	Molybdenum	0.4	Sodium	7		

NR - Not Reported

MC - Element greater than 100 ppm; sample was thermally ashed @ 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

TABLE F61. SSMS DATA FOR LETC SAMPLE #III-2-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	MC	Neodymium	<0.006	Strontium	0.3
Antimony	≤0.01	Gadolinium	<0.006	Nickel	INT	Sulfur	MC
Arsenic	2	Gallium	6	Niobium	0.008	Tantalum	<0.006
Barium	0.2	Germanium	0.04	Osmium	<0.006	Tellurium	<0.006
Beryllium	<0.006	Gold	<0.006	Palladium	<0.006	Terbium	<0.006
Bismuth	<0.006	Hafnium	<0.006	Phosphorus	1	Thallium	<0.006
Boron	5	Holmium	<0.006	Platinum	<0.006	Thorium	<0.006
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.006
Cadmium	<0.006	Iodine	0.09	Praseodymium	<0.006	Tin	<0.006
Calcium	MC	Iridium	<0.006	Rhenium	<0.006	Titanium	2
Cerium	<0.006	Iron	*2	Rhodium	<0.006	Tungsten	<0.006
Cesium	0.05	Lanthanum	<0.006	Rubidium	*0.1	Uranium	<0.006
Chlorine	MC	Lead	<0.006	Ruthenium	<0.006	Vanadium	*0.1
Chromium	≤0.002	Lithium	0.3	Samarium	<0.006	Ytterbium	<0.006
Cobalt	≤0.01	Lutetium	<0.006	Scandium	≤0.009	Yttrium	<0.006
Copper	0.02	Magnesium	MC	Selenium	0.09	Zinc	0.05
Dysprosium	<0.006	Manganese	0.09	Silicon	MC	Zirconium	0.01
Erbium	<0.006	Mercury	NR	Silver	0.008		
Europium	<0.006	Molybdenum	0.02	Sodium	MC		

NR - Not Reported
MC - Major Component
*Heterogenous

TABLE F62. SSMS DATA FOR LETC SAMPLE #III-6-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.004	Fluorine	≈3	Neodymium	<0.001	Strontium	0.02
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	≥8
Arsenic	0.003	Gallium	0.002	Niobium	<0.001	Tantalum	<0.001
Barium	0.06	Germanium	0.002	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.01	Hafnium	<0.001	Phosphorus	0.2	Thallium	<0.001
Boron	0.01	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.09	Indium	STD	Potassium	0.5	Thulium	<0.001
Cadmium	<0.001	Iodine	0.006	Praseodymium	<0.001	Tin	0.003
Calcium	7	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.03
Cerium	0.002	Iron	0.1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.007	Uranium	<0.001
Chlorine	MC	Lead	0.2	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.004	Lithium	0.04	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	5	Selenium	≤0.003	Zinc	0.04
Dysprosium	<0.001	Manganese	0.02	Silicon	4	Zirconium	0.008
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	≥3		

NR – Not Reported
MC – Major Component

TABLE F63. SSMS DATA FOR LETC SAMPLE #III-7-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.002	Fluorine	≈9	Neodymium	<0.001	Strontium	0.03
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	≥6
Arsenic	0.002	Gallium	0.001	Niobium	≤0.001	Tantalum	<0.001
Barium	0.2	Germanium	0.009	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.4	Thallium	<0.001
Boron	0.4	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.3	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.02	Praseodymium	<0.001	Tin	0.002
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.02
Cerium	<0.001	Iron	0.09	Rhodium	<0.001	Tungsten	0.005
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.02	Uranium	<0.001
Chlorine	MC	Lead	0.006	Ruthenium	<0.001	Vanadium	<0.001
Chromium	0.005	Lithium	0.3	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.01	Magnesium	1	Selenium	0.005	Zinc	0.03
Dysprosium	<0.001	Manganese	0.02	Silicon	8	Zirconium	0.006
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.007	Sodium	≥2		

NR - Not Reported
MC - Major Component
INT - Interference

TABLE F64. SSMS DATA FOR LETC SAMPLE #III-8-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈9	Neodymium	<0.005	Strontium	0.07
Antimony	<0.005	Gadolinium	<0.005	Nickel	INT	Sulfur	MC
Arsenic	0.03	Gallium	0.2	Niobium	0.007	Tantalum	<0.005
Barium	0.1	Germanium	<0.005	Osmium	<0.005	Tellurium	≤0.01
Beryllium	<0.005	Gold	<0.005	Palladium	<0.005	Terbium	<0.005
Bismuth	<0.005	Hafnium	<0.005	Phosphorus	0.4	Thallium	<0.005
Boron	0.5	Holmium	<0.005	Platinum	<0.005	Thorium	<0.005
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.005
Cadmium	<0.005	Iodine	0.007	Praseodymium	<0.005	Tin	≤0.01
Calcium	MC	Iridium	<0.005	Rhenium	<0.005	Titanium	1
Cerium	0.007	Iron	0.06	Rhodium	<0.005	Tungsten	<0.005
Cesium	0.003	Lanthanum	0.01	Rubidium	0.01	Uranium	<0.005
Chlorine	MC	Lead	<0.005	Ruthenium	<0.005	Vanadium	0.002
Chromium	0.02	Lithium	0.2	Samarium	<0.005	Ytterbium	<0.005
Cobalt	≤0.009	Lutetium	<0.005	Scandium	≤0.007	Yttrium	≤0.004
Copper	0.03	Magnesium	MC	Selenium	≤0.01	Zinc	0.09
Dysprosium	<0.005	Manganese	≤0.001	Silicon	9	Zirconium	0.04
Erbium	<0.005	Mercury	NR	Silver	<0.005		
Europium	<0.005	Molybdenum	0.03	Sodium	MC		

NR - Not Reported
MC - Major Component
INT - Interference

TABLE F65. SSMS DATA FOR LETC SAMPLE #III-9-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.002	Fluorine	≈6	Neodymium	<0.001	Strontium	0.1
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	MC
Arsenic	0.009	Gallium	0.002	Niobium	≤0.002	Tantalum	<0.001
Barium	0.04	Germanium	0.004	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	0.006	Hafnium	<0.001	Phosphorus	7	Thallium	<0.001
Boron	0.07	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.003	Praseodymium	<0.001	Tin	0.003
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.04
Cerium	<0.001	Iron	0.04	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.006	Uranium	≤0.01
Chlorine	MC	Lead	0.007	Ruthenium	<0.001	Vanadium	≤0.001
Chromium	0.003	Lithium	0.05	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.003	Lutetium	<0.001	Scandium	≤0.002	Yttrium	<0.001
Copper	0.009	Magnesium	MC	Selenium	0.002	Zinc	0.01
Dysprosium	<0.001	Manganese	0.002	Silicon	8	Zirconium	0.005
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.02	Sodium	≥4		

NR - Not Reported
MC - Major Component
INT - Interference

TABLE F66. SSMS DATA FOR LETC SAMPLE #III-10-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.005	Fluorine	≈4	Neodymium	<0.001	Strontium	0.07
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	≥7
Arsenic	0.006	Gallium	0.002	Niobium	≤0.001	Tantalum	<0.001
Barium	0.05	Germanium	≤0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	2	Thallium	<0.001
Boron	0.09	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	0.005	Praseodymium	<0.001	Tin	0.004
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.03
Cerium	0.002	Iron	*0.2	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	0.003	Rubidium	0.008	Uranium	0.02
Chlorine	MC	Lead	0.009	Ruthenium	<0.001	Vanadium	0.002
Chromium	0.003	Lithium	0.07	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.04	Magnesium	5	Selenium	0.006	Zinc	0.03
Dysprosium	<0.001	Manganese	0.01	Silicon	2	Zirconium	0.007
Erbium	<0.001	Mercury	NR	Silver	≤0.001		
Europium	<0.001	Molybdenum	0.01	Sodium	3		

NR - Not Reported

MC - Major Component

INT - Interference

*Heterogeneous

TABLE F67. SSMS DATA FOR LETC SAMPLE #III-11-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.005	Fluorine	≈8	Neodymium	<0.002	Strontium	0.3
Antimony	<0.002	Gadolinium	<0.002	Nickel	INT	Sulfur	MC
Arsenic	0.04	Gallium	0.007	Niobium	<0.002	Tantalum	<0.002
Barium	0.1	Germanium	0.005	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	<0.002	Hafnium	<0.002	Phosphorus	4	Thallium	<0.002
Boron	0.4	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.8	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	<0.002	Iodine	0.04	Praseodymium	<0.002	Tin	<0.002
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.05
Cerium	<0.002	Iron	0.4	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	<0.002	Rubidium	0.04	Uranium	<0.002
Chlorine	MC	Lead	0.01	Ruthenium	<0.002	Vanadium	0.004
Chromium	0.005	Lithium	0.2	Samarium	<0.002	Ytterbium	<0.002
Cobalt	≤0.003	Lutetium	<0.002	Scandium	≤0.003	Yttrium	<0.002
Copper	0.02	Magnesium	4	Selenium	0.03	Zinc	0.02
Dysprosium	<0.002	Manganese	0.01	Silicon	MC	Zirconium	0.01
Erbium	<0.002	Mercury	NR	Silver	<0.002		
Europium	<0.002	Molybdenum	0.5	Sodium	≥5		

NR - Not Reported
MC - Major Component
INT - Interference

TABLE F68. SSMS DATA FOR LETC SAMPLE #III-12-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.006	Fluorine	≈2	Neodymium	<0.001	Strontium	0.02
Antimony	<0.001	Gadolinium	<0.001	Nickel	INT	Sulfur	≥4
Arsenic	0.003	Gallium	<0.001	Niobium	<0.001	Tantalum	<0.001
Barium	0.04	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	<0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	1	Thallium	<0.001
Boron	0.02	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.07	Indium	STD	Potassium	≥7	Thulium	<0.001
Cadmium	<0.001	Iodine	0.002	Praseodymium	<0.001	Tin	<0.001
Calcium	5	Iridium	<0.001	Rhenium	<0.001	Titanium	≤0.01
Cerium	<0.001	Iron	*1	Rhodium	<0.001	Tungsten	<0.001
Cesium	<0.001	Lanthanum	<0.001	Rubidium	0.004	Uranium	<0.001
Chlorine	MC	Lead	≤0.002	Ruthenium	<0.001	Vanadium	<0.001
Chromium	≤0.001	Lithium	0.08	Samarium	<0.001	Ytterbium	<0.001
Cobalt	*0.002	Lutetium	<0.001	Scandium	≤0.001	Yttrium	<0.001
Copper	0.02	Magnesium	7	Selenium	<0.001	Zinc	0.008
Dysprosium	<0.001	Manganese	0.02	Silicon	5	Zirconium	≤0.001
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	0.03	Sodium	≥2		

NR - Not Reported
MC - Major Component
INT - Interference
* Heterogeneous

TABLE F69. SSMS DATA FOR LETC SAMPLE #III-13-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.01	Fluorine	≈7	Neodymium	<0.002	Strontium	0.03
Antimony	<0.002	Gadolinium	<0.002	Nickel	INT	Sulfur	MC
Arsenic	0.004	Gallium	≤0.001	Niobium	<0.002	Tantalum	<0.002
Barium	0.05	Germanium	<0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	0.02	Hafnium	<0.002	Phosphorus	0.7	Thallium	<0.002
Boron	0.02	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.04	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	≤0.003	Iodine	<0.002	Praseodymium	<0.002	Tin	<0.002
Calcium	3	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.04
Cerium	<0.002	Iron	0.003	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	<0.002	Rubidium	0.004	Uranium	<0.002
Chlorine	MC	Lead	<0.002	Ruthenium	<0.002	Vanadium	<0.001
Chromium	0.005	Lithium	0.03	Samarium	<0.002	Ytterbium	<0.002
Cobalt	≤0.003	Lutetium	<0.002	Scandium	≤0.002	Yttrium	<0.002
Copper	0.009	Magnesium	4	Selenium	0.003	Zinc	0.01
Dysprosium	<0.002	Manganese	0.01	Silicon	5	Zirconium	0.01
Erbium	<0.002	Mercury	NR	Silver	0.08		
Europium	<0.002	Molybdenum	0.02	Sodium	≥5		

NR – Not Reported
MC – Major Component
INT – Interference

TABLE F70. SSMS DATA FOR LETC SAMPLE #III-14-7.

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	*0.08	Fluorine	≃7	Neodymium	<0.002	Strontium	0.8
Antimony	<0.002	Gadolinium	<0.002	Nickel	INT	Sulfur	MC
Arsenic	0.009	Gallium	0.003	Niobium	<0.002	Tantalum	<0.002
Barium	0.02	Germanium	0.002	Osmium	<0.002	Tellurium	<0.002
Beryllium	<0.002	Gold	<0.002	Palladium	<0.002	Terbium	<0.002
Bismuth	0.01	Hafnium	<0.002	Phosphorus	0.1	Thallium	<0.002
Boron	0.08	Holmium	<0.002	Platinum	<0.002	Thorium	<0.002
Bromine	0.4	Indium	STD	Potassium	MC	Thulium	<0.002
Cadmium	<0.002	Iodine	<0.002	Praseodymium	<0.002	Tin	0.006
Calcium	MC	Iridium	<0.002	Rhenium	<0.002	Titanium	≤0.04
Cerium	0.003	Iron	3	Rhodium	<0.002	Tungsten	<0.002
Cesium	<0.002	Lanthanum	<0.002	Rubidium	0.02	Uranium	<0.002
Chlorine	MC	Lead	0.01	Ruthenium	<0.002	Vanadium	≤0.001
Chromium	0.005	Lithium	0.1	Samarium	<0.002	Ytterbium	<0.002
Cobalt	≤0.003	Lutetium	<0.002	Scandium	≤0.002	Yttrium	≤0.001
Copper	0.06	Magnesium	MC	Selenium	≤0.003	Zinc	0.05
Dysprosium	<0.002	Manganese	0.1	Silicon	5	Zirconium	0.003
Erbium	<0.002	Mercury	NR	Silver	0.002		
Europium	<0.002	Molybdenum	0.009	Sodium	≥5		

NR — Not Reported
MC — Major Component Note: Particulate matter was suspended in the sample. Sample was shaken and an aliquot taken prior to analysis.
* Heterogeneous
INT - Interference

TABLE F71. SSMS DATA FOR SAMPLE RA-18 (LIQUOR)

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.04	Fluorine	≈0.6	Neodymium	<0.004	Strontium	0.1
Antimony	0.03	Gadolinium	<0.004	Nickel	0.06	Sulfur	MC
Arsenic	0.7	Gallium	0.003	Niobium	<0.004	Tantalum	<0.004
Barium	0.9	Germanium	0.2	Osmium	<0.004	Tellurium	<0.004
Beryllium	<0.004	Gold	<0.004	Palladium	<0.004	Terbium	<0.004
Bismuth	<0.004	Hafnium	<0.004	Phosphorus	2	Thallium	<0.004
Boron	0.04	Holmium	<0.004	Platinum	<0.004	Thorium	<0.004
Bromine	0.04	Indium	STD	Potassium	8	Thulium	<0.004
Cadmium	≤0.007	Iodine	≤0.004	Praseodymium	<0.004	Tin	4
Calcium	5	Iridium	<0.004	Rhenium	<0.004	Titanium	0.05
Cerium	0.005	Iron	4	Rhodium	<0.004	Tungsten	<0.004
Cesium	<0.004	Lanthanum	0.009	Rubidium	0.002	Uranium	<0.004
Chlorine	0.08	Lead	≤0.02	Ruthenium	<0.004	Vanadium	0.02
Chromium	0.02	Lithium	0.04	Samarium	<0.004	Ytterbium	<0.004
Cobalt	≤0.006	Lutetium	<0.004	Scandium	≤0.002	Yttrium	<0.004
Copper	0.02	Magnesium	7	Selenium	≤0.02	Zinc	0.2
Dysprosium	<0.004	Manganese	0.008	Silicon	1	Zirconium	0.06
Erbium	<0.004	Mercury	NR	Silver	0.1		
Europium	<0.004	Molybdenum	0.1	Sodium	MC		

NR-Not Reported

Sample was low temperature ashed @ 350°C in a laboratory furnace in a quartz crucible prior to analysis.

MC-Major Component

TABLE F72. SSMS DATA FOR SAMPLE RA-18 (PRODUCT TAR).

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	>240	Fluorine	≈37	Neodymium	<0.2	Strontium	96
Antimony	1	Gadolinium	<0.2	Nickel	10	Sulfur	490
Arsenic	40	Gallium	3	Niobium	0.3	Tantalum	<0.2
Barium	*640	Germanium	2	Osmium	<0.2	Tellurium	<0.2
Beryllium	<0.1	Gold	<0.2	Palladium	<0.2	Terbium	<0.2
Bismuth	0.8	Hafnium	<0.2	Phosphorus	140	Thallium	<0.2
Boron	10	Holmium	<0.2	Platinum	<0.2	Thorium	≤2
Bromine	0.5	Indium	STD	Potassium	98	Thulium	<0.2
Cadmium	<0.2	Iodine	0.2	Praseodymium	0.3	Tin	3
Calcium	MC	Iridium	<0.2	Rhenium	<0.2	Titanium	72
Cerium	0.5	Iron	580	Rhodium	<0.2	Tungsten	<0.2
Cesium	<0.1	Lanthanum	0.5	Rubidium	<0.1	Uranium	<0.2
Chlorine	13	Lead	170	Ruthenium	<0.2	Vanadium	8
Chromium	11	Lithium	1	Samarium	<0.2	Ytterbium	<0.2
Cobalt	0.4	Lutetium	<0.2	Scandium	≤0.3	Yttrium	≤0.2
Copper	6	Magnesium	MC	Selenium	1	Zinc	160
Dysprosium	<0.2	Manganese	10	Silicon	MC	Zirconium	0.7
Erbium	<0.2	Mercury	NR	Silver	≤0.2		
Europium	<0.2	Molybdenum	5	Sodium	>610		

* Heterogeneous sample was low temperature ashed @ 350°C in a laboratory furnace in a quartz crucible prior to analysis.

NR- Not Reported

MC-Major Component

TABLE F73. SSMS DATA FOR PERC #HG-2

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈390	Neodymium	49	Strontium	MC
Antimony	2	Gadolinium	6	Nickel	460	Sulfur	MC
Arsenic	9	Gallium	37	Niobium	46	Tantalum	≤0.4
Barium	MC	Germanium	6	Osmium	<0.1	Tellurium	<0.1
Beryllium	37	Gold	<0.1	Palladium	<0.1	Terbium	2
Bismuth	<0.1	Hafnium	3	Phosphorus	MC	Thallium	0.1
Boron	83	Holmium	3	Platinum	<0.1	Thorium	48
Bromine	10	Indium	STD	Potassium	MC	Thulium	0.3
Cadmium	0.8	Iodine	0.4	Praseodymium	23	Tin	1
Calcium	MC	Iridium	<0.1	Rhenium	<0.1	Titanium	MC
Cerium	520	Iron	MC	Rhodium	<0.1	Tungsten	6
Cesium	7	Lanthanum	460	Rubidium	96	Uranium	39
Chlorine	280	Lead	8	Ruthenium	<0.1	Vanadium	560
Chromium	320	Lithium	100	Samarium	23	Ytterbium	3
Cobalt	110	Lutetium	0.6	Scandium	65	Yttrium	160
Copper	200	Magnesium	MC	Selenium	14	Zinc	29
Dysprosium	5	Manganese	130	Silicon	MC	Zirconium	720
Erbium	3	Mercury	NR	Silver	0.2		
Europium	3	Molybdenum	12	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE F74. SSMS DATA FOR PERC #HG-9

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	MC	Fluorine	≈270	Neodymium	21	Strontium	380
Antimony	3	Gadolinium	1	Nickel	87	Sulfur	MC
Arsenic	88	Gallium	70	Niobium	22	Tantalum	<0.1
Barium	450	Germanium	9	Osmium	<0.1	Tellurium	<0.1
Beryllium	5	Gold	<0.1	Palladium	<0.1	Terbium	0.4
Bismuth	<0.1	Hafnium	0.6	Phosphorus	MC	Thallium	<0.1
Boron	40	Holmium	0.5	Platinum	<0.1	Thorium	10
Bromine	7	Indium	STD	Potassium	MC	Thulium	≤0.1
Cadmium	0.3	Iodine	1	Praseodymium	5	Tin	2
Calcium	MC	Iridium	<0.1	Rhenium	<0.1	Titanium	MC
Cerium	110	Iron	MC	Rhodium	<0.1	Tungsten	2
Cesium	3	Lanthanum	98	Rubidium	36	Uranium	8
Chlorine	360	Lead	38	Ruthenium	<0.1	Vanadium	71
Chromium	72	Lithium	33	Samarium	8	Ytterbium	0.6
Cobalt	29	Lutetium	≤0.1	Scandium	7	Yttrium	78
Copper	100	Magnesium	MC	Selenium	9	Zinc	160
Dysprosium	0.8	Manganese	64	Silicon	MC	Zirconium	140
Erbium	0.4	Mercury	NR	Silver	0.3		
Europium	0.6	Molybdenum	11	Sodium	MC		

NR - Not Reported

MC - Major Component

TABLE F75. LAWRENCE LIVERMORE HOE CREEK 80577-WS-3 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	methylene chloride	<1
0.09	acetone	~62
0.10	carbon disulfide	<1
0.18	chloroform	<1
0.40	benzene	<1
0.67	toluene	<1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE F76. LAWRENCE LIVERMORE HOE CREEK 80577-WS-6 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	methylene chloride	~15
0.09	carbon disulfide	~1
0.19	chloroform	~1
0.74	toluene	~1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE F77. LAWRENCE LIVERMORE HOE CREEK 80577-WS-8 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	~3
0.11	carbon disulfide	~1
0.19	chloroform	~1
0.83	air + column artifact	
0.99	column artifact	
1.00	2-CHLOROETHYLBENZENE	IS
1.04	column artifact	

*Relative to the internal standard 2-chloroethylbenzene.

TABLE F78. LAWRENCE LIVERMORE HOE CREEK 80577-WS-9 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	∿640
0.11	carbon disulfide	blank contaminant
0.19	chloroform	<1
1.00	2-CHLOROETHYLBENZENE	IS

*Relative to the internal standard 2-chloroethylbenzene.

TABLE F79. LAWRENCE LIVERMORE HOE CREEK 100477-WS-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	methylene chloride	blank contaminant
0.19	carbon disulfide	blank contaminant
0.25	unknown	
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F80. LAWRENCE LIVERMORE HOE CREEK 100477-WS-2 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.08	methylene chloride	blank contaminant
0.18	carbon disulfide	blank contaminant
0.24	unknown	
0.27	unknown	
0.91	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.55	toluene (tentative)	<1
1.79	air spike	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F81. LAWRENCE LIVERMORE HOE CREEK 100477-WS-3 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (PPB)
0.11	methylene chloride	blank contaminant
0.18	carbon disulfide	1
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.93	column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F82. LAWRENCE LIVERMORE HOE CREEK 100477-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	3
0.20	carbon disulfide	blank contaminant
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F83. LAWRENCE LIVERMORE HOE CREEK 100477-WS-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	blank contaminant
0.18	carbon disulfide	blank contaminant
0.20	trichlorofluoromethane	4
0.24	unknown	
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F84. LAWRENCE LIVERMORE HOE CREEK 100477-WS-9 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	blank contaminant
0.19	carbon disulfide	blank contaminant
0.26	unknown	
1.00	1,2-DIBROMOETHANE	IS
1.57	toluene (tentative)	<1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F85. LAWRENCE LIVERMORE HOE CREEK 100477-B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	methylene chloride	>124
0.18	carbon disulfide	<1
0.37	chloroform	1
0.92	benzene	<1
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F86. LAWRENCE LIVERMORE HOE CREEK SAMPLE #120277-WS-2 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.21	acetonitrile	>20000
0.31	acetone	>20000
0.43	noise spike	
0.59	2-butanone	>20000
0.93	methylcyclopentene isomer (tentative)	NQ
0.97	benzene	>20000
1.00	1,2-DIBROMOETHANE	IS
1.08	n-hexane	>20000
1.13	dimethylcyclopentene isomer (tentative)	NQ
1.17	C_7H_{12} isomer (tentative)	NQ
1.22	methylthiophene isomer +	∿1800
	C_8H_{14} isomer (tentative)	NQ
1.24	methylthiophene isomer	∿7500
1.34	C_7H_{12} isomer (tentative)	NQ
1.39	noise spike	
1.42	C_8H_{14} isomer (tentative)	NQ
1.49	toluene	>20000
1.62	noise spike	
1.70	ethylbenzene	>20000
1.82	column artifact	
1.84	C_8H_{18} isomer	>20000
1.94	m- and/or p-xylene	>20000
1.98	o-xylene	>20000
2.03	n-propylbenzene	17000
2.18	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	>20000
2.23	o-ethyltoluene	>20000
2.26	n-nonane	>20000
2.36	$C_{10}H_{14}$ isomer	>20000
2.55	$C_{10}H_{14}$ isomer	>20000
2.56	$C_{10}H_{12}$ isomer (tentative)	NQ
2.78	noise spike	
2.86	C_9H_{12} isomer	>20000
2.89	trimethylbenzene isomer	>20000
2.95	C_9H_{12} isomer	∿5000
2.96	C_9H_{12} isomer	>20000

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F87. LAWRENCE LIVERMORE HOE CREEK SAMPLE #120277-WS-4 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	methylene chloride	25
0.15	acetone	~240
0.66	thiophene	270
0.88	3-methylcyclopentene (tentative)	NQ
0.91	benzene	>20000
1.00	1,2-DIBROMOETHANE	IS
1.26	methylthiophene isomer	~1500
1.37	3-methyl-2,4-hexadiene (tentative)	NQ
1.53	toluene	>20000
1.58	3,5,5-trimethylcyclohexene (tentative)	NQ
1.60	C_8H_{14} isomer (tentative)	NQ
1.64	unknown	
1.68	C_8H_{14} isomer (tentative)	NQ
1.73	unknown	
1.82	ethylbenzene	>20000
1.85	unknown	
1.88	unknown	
1.92	unknown	
1.95	C_9H_{12} isomer	~2700
1.97	n-octane	>20000
2.02	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
2.09	m- and/or p-xylene	>20000
2.14	o-xylene	>20000
2.20	n-propylbenzene	14000
2.22	2-methylcyclopentanone	>20000
2.27	unknown	
2.31	C_9H_{12} isomer + o-methylstyrene (tentative)	>20000 NQ
2.36	ethyltoluene isomer	>20000
2.38	n-nonane	>20000
2.41	$C_{10}H_{14}$ isomer	~6000
2.44	$C_{10}H_{14}$ isomer	>20000
2.50	indene	>20000
2.55	$C_{10}H_{12}$ isomer (tentative) + $C_{10}H_{14}$ isomer	NQ ~8000
2.62	ethylstyrene isomer (tentative)	NQ
2.65	trimethylbenzene isomer	>20000
2.69	trimethylbenzene isomer	>20000
2.77	n-decane (tentative)	NQ
2.84	4-methyl-(2,3-dihydroindene) (tentative)	NQ
2.87	diethylbenzene isomer	>20000
2.90	$C_{10}H_{12}$ isomer (tentative)	NQ
3.01	n-pentylbenzene (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F88. LAWRENCE LIVERMORE HOE CREEK SAMPLE #120277-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	2100
0.23	unknown	
0.50	chloroform	890
0.94	benzene	15000
1.00	1,2-DIBROMOETHANE	IS
1.19	methylthiophene isomer	~180
1.39	toluene	6000
1.58	ethylbenzene	1100
1.71	unknown	
1.79	m- and/or p-xylene	1400
1.82	o-xylene	1700
1.86	n-propylbenzene	270
1.95	o-methylstyrene (tentative) + C_9H_{12} isomer	NQ ~900
2.01	ethyltoluene isomer	~1100
2.06	$C_{10}H_{14}$ isomer	~680
2.11	indene	480
2.17	$C_{10}H_{12}$ isomer (tentative) + diethylbenzene isomer	NQ <1
2.27	C_9H_{12} isomer	~1500
2.34	C_9H_{12} isomer	~1200
2.43	alkane (tentative)	NQ
2.53	$C_{10}H_{12}$ isomer (tentative)	NQ
2.63	$C_{10}H_{12}$ isomer (tentative)	NQ
3.15	naphthalene (tentative)	NQ
3.23	alkane (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F89. LAWRENCE LIVERMORE SAMPLE #010678-WS-2 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	methylene chloride	130
0.14	acetone	1700
0.18	carbon disulfide	5
0.52	2-butanone	1900
0.67	thiophene	37
0.92	benzene	1700
1.00	1,2-DIBROMOETHANE	IS
1.24	methylthiophene isomer	~4
1.26	methylthiophene isomer	~55
1.53	toluene	680
1.58	ethylthiophene isomer (tentative) noise spike	NQ
1.80	dimethylthiophene isomer (tentative) +	NQ
	ethylbenzene	840
2.05	m- and/or p-xylene	420
2.12	o-xylene	610
2.17	n-propylbenzene	72
2.22	benzofuran	420
2.29	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	~270
2.32	o-ethyltoluene	350
2.36	$C_7H_{10}S$ isomer (tentative) +	NQ
	$C_{10}H_{14}$ isomer	~37
2.41	$C_{10}H_{14}$ isomer	~250
2.46	indene	2900
2.49	$C_{10}H_{12}$ isomer (tentative)	NQ
2.57	$C_{10}H_{12}$ isomer (tentative)	NQ
2.61	trimethylbenzene isomer	~690
2.65	trimethylbenzene isomer	~990
2.71	C_9H_8O isomer	~780
2.79	$C_{10}H_{12}$ isomer (tentative)	NQ
2.85	$C_{10}H_{12}$ isomer (tentative)	NQ
2.97	$C_{11}H_{16}$ isomer (tentative)	NQ
3.03	$C_{10}H_{10}$ isomer (tentative)	NQ
3.14	methylindene isomer (tentative)	NQ
3.22	naphthalene (tentative)	NQ
3.36	tetramethylbenzene isomer	~1200
3.56	tetramethylbenzene isomer	~1600

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F90. LAWRENCE LIVERMORE SAMPLE #010578-WS-3 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.11	methylene chloride	140
0.13	dimethyl sulfide (tentative)	NQ
0.15	acetone	8800
0.19	carbon disulfide	4
0.51	2-butanone	7100
0.92	benzene	2800
1.00	1,2-DIBROMOETHANE	IS
1.25	methylthiophene isomer	∿22
1.53	toluene	710
1.79	ethylbenzene	9
2.06	m- and/or p-xylene	150
2.10	o-xylene	180
2.16	n-propylbenzene	9
2.28	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿20
2.31	o-ethyltoluene	49
2.45	noise spike	
2.47	indene	100
2.61	trimethylbenzene isomer	∿33
2.65	C_9H_{12} isomer	∿32
2.79	$C_{10}H_{12}$ isomer (tentative)	NQ
3.22	naphthalene (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F91. LAWRENCE LIVERMORE SAMPLE #010478-WS-4 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.19	acetone	51
0.68	thiophene	15
0.92	benzene	14000
1.00	1,2-DIBROMOETHANE	IS
1.24	methylthiophene isomer	~1
1.26	methylthiophene isomer	~21
1.54	toluene	2300
1.80	ethylbenzene	220
2.07	m- and/or p-xylene	300
2.11	o-xylene	400
2.17	C_3 alkylbenzene isomer	~22
2.23	benzofuran	2
2.28	o-methylstyrene (tentative) + C_9H_{12} isomer	~17
2.32	o-ethyltoluene	86
2.35	branched alkane (tentative)	NQ
2.40	butylbenzene isomer	~8
2.46	indene + column artifact	29
2.50	$C_{10}H_{12}$ isomer (tentative)	NQ
2.61	C_9H_{12} isomer	~26
2.65	trimethylbenzene isomer + column artifact	~33
2.72	~C_{10} branched alkane (tentative)	NQ
2.81	unknown + column artifact	
2.85	branched alkane + (tentative)	NQ
2.87	unknown	
3.10	unknown + column artifact	
3.23	naphthalene (tentative)	NQ
3.29	n-undecane (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F92. LAWRENCE LIVERMORE SAMPLE #010478-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	methylene chloride	700
0.19	acetone	>20000
0.52	2-butanone	>20000
0.69	thiophene	190
0.96	benzene	18000
1.00	1,2-DIBROMOETHANE	IS
1.28	methylthiophene isomer	~33
1.30	methylthiophene isomer	~210
1.58	toluene	18000
1.86	ethylbenzene	2000
2.15	m- and/or p-xylene	3200
2.20	o-xylene	3800
2.26	n-propylbenzene	150
2.31	benzofuran	280
2.39	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	~150
2.43	o-ethyltoluene	840
2.58	indene	490
2.66	C_9H_{12} isomer	~55
2.78	trimethylbenzene isomer	~240
2.83	trimethylbenzene isomer	~280

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F93. LAWRENCE LIVERMORE SAMPLE #010478-WS-6 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentrations (ppb)
0.01	air	
0.07	methylene chloride	390
0.12	unknown	
0.15	acetone	∿130
0.37	cyclopentene (tentative)	NQ
0.41	chloroform	15
0.63	C_5H_{10} isomer (tentative)	NQ
0.67	thiophene	490
0.79	dimethyl disulfide (tentative)	NQ
0.89	3-methylcyclopentene (tentative)	NQ
0.91	benzene	>20000
1.00	1,2-DIBROMOETHANE	IS
1.23	methylthiophene isomer	∿86
1.25	methylthiophene isomer	∿650
1.36	3-methyl-2,4-hexadiene (tentative)	NQ
1.51	toluene	>20000
1.57	ethylthiophene isomer (tentative)	NQ
1.79	ethylbenzene	7100
1.86	dimethylthiophene isomer (tentative)	NQ
2.06	m- and/or p-xylene	4400
2.09	o-xylene	5100
2.15	n-propylbenzene	320
2.21	benzofuran	720
2.27	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿660
2.31	o-ethyltoluene	1400
2.39	$C_{10}H_{14}$ isomer	∿490
2.44	indene	1500
2.49	$C_{10}H_{12}$ isomer (tentative)	NQ
2.51	C_9H_{12} isomer	∿290
2.56	$C_{10}H_{12}$ isomer (tentative)	NQ
2.60	trimethylbenzene isomer	∿1000
2.63	C_9H_{12} isomer	∿1100
2.71	$C_{10}H_{14}$ isomer +	∿170
	branched alkane (tentative)	NQ
2.78	$C_{10}H_{12}$ isomer (tentative)	NQ
2.83	$C_{10}H_{12}$ isomer (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F94. LAWRENCE LIVERMORE SAMPLE #010478-WS-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentrations (ppb)
0.13	methylene chloride	12
0.68	thiophene	10
0.94	benzene	>20000
1.00	1,2-DIBROMOETHANE	IS
1.25	methylthiophene isomer	~14
1.26	methylthiophene isomer	~100
1.54	toluene	>20000
1.59	ethylthiophene isomer (tentative)	NQ
1.81	ethylbenzene	1400
2.09	m- and/or p-xylene	1700
2.13	o-xylene	2000
2.18	n-propylbenzene	90
2.30	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	~155
2.34	o-ethyltoluene	370
2.38	$C_7H_{10}S$ isomer (tentative)	NQ
2.42	butylbenzene isomer	~40
2.47	indene	200
2.51	$C_{10}H_{12}$ isomer (tentative)	NQ
2.55	C_9H_{12} isomer	~70
2.63	trimethylbenzene isomer	~190
2.67	C_9H_{12} isomer	~210
2.81	$C_{10}H_{12}$ isomer (tentative)	NQ
2.88	$C_{10}H_{12}$ isomer (tentative) + column artifact	NQ
3.24	naphthalene (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F95. LAWRENCE LIVERMORE SAMPLE #010478-WS-8 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	75
0.17	acetone	40
0.37	cyclopentene (tentative)	NQ
0.51	air	
0.68	thiophene	520
0.92	benzene	>20000
1.00	1,2-DIBROMOETHANE	IS
1.23	methylthiophene isomer	∿7
1.24	methylthiophene isomer	∿50
1.52	toluene	>20000
1.79	ethylbenzene	1900
1.92	C_9H_{12} isomer	∿23
2.05	m- and/or p-xylene	1900
2.10	o-xylene	2000
2.15	n-propylbenzene	250
2.26	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿210
2.31	o-ethyltoluene	1200
2.34	C_9H_{12} isomer	<1
2.37	$C_{10}H_{14}$ isomer	∿170
2.44	indene	63
2.47	$C_{10}H_{12}$ isomer (tentative)	NQ
2.50	C_9H_{12} isomer	∿58
2.56	$C_{10}H_{12}$ isomer (tentative) +	NQ
	C_8H_{12} isomer (tentative)	NQ
2.58	C_9H_{12} isomer	∿310
2.62	trimethylbenzene isomer	∿380
2.69	$C_{10}H_{14}$ isomer	∿75
2.76	$C_{10}H_{12}$ isomer (tentative)	NQ
2.79	$C_{10}H_{14}$ isomer	∿390
2.82	$C_{10}H_{12}$ isomer (tentative)	NQ
3.01	dimethylindan isomer (tentative)	NQ
3.10	dimethylindan isomer (tentative)	NQ
3.19	naphthalene (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F96. LAWRENCE LIVERMORE SAMPLE #010478-WS-9 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.12	methylene chloride	79
0.26	carbon disulfide	1
0.85	air	
0.93	instrument noise	
0.93	benzene	3100
1.00	1,2-DIBROMOETHANE	IS
1.51	toluene	620
1.76	ethylbenzene	8
2.03	m- and/or p-xylene	41
2.07	o-xylene	37

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F97. LAWRENCE LIVERMORE HOE CREEK 011778-A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.08	acetonitrile	5700
0.11	methylene chloride	<1
0.18	acetone	960
0.27	unknown	
0.52	2-butanone	2600
0.65	thiophene	∿83
0.96	benzene	∿1300
1.00	1,2-DIBROMOETHANE	IS
1.35	2-methylthiophene	∿87
1.63	toluene	300
2.02	ethylbenzene	39
2.33	m- and/or p-xylene	70
2.38	o-xylene	81
2.44	n-propylbenzene	6
2.59	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿1
2.63	ethyltoluene isomer	∿450
2.80	indene	50
2.84	$C_{10}H_{12}$ isomer (tentative) +	NQ
	$C_{10}H_{14}$ isomer	∿3
2.89	trimethylbenzene isomer	∿8
2.99	trimethylbenzene isomer	∿41
3.03	trimethylbenzene isomer	∿29
3.22	$C_{10}H_{12}$ isomer (tentative)	NQ
3.28	$C_{10}H_{12}$ isomer (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F98. LAWRENCE LIVERMORE HOE CREEK 011778-B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	acetonitrile	720
0.12	methylene chloride	8
0.17	acetone	690
0.21	carbon disulfide	1
0.24	air	
0.25	unknown	
0.28	unknown	
0.29	unknown	
0.46	2-butanone	720
0.68	unknown	
0.84	benzene	15
1.00	1,2-DIBROMOETHANE	IS
1.46	toluene	2
2.41	air spike	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F99. LAWRENCE LIVERMORE SAMPLE #021478-A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	methylene chloride	910
0.95	benzene	170
1.00	1,2-DIBROMOETHANE	IS
1.93	instrument noise	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F100. LAWRENCE LIVERMORE SAMPLE 021478-C VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	acetonitrile	620
0.11	methylene chloride	blank contaminant
0.17	acetone	2100
0.42	chloroform	5
0.52	2-butanone	460
0.75	3-methyl-2-butanone	84
0.88	trichloroethylene	100
0.95	benzene	28
1.00	1,2-DIBROMOETHANE	IS
1.15	$C_6H_{10}O$ isomer	∿130
1.28	methylthiophene isomer	<1
1.29	methylthiophene isomer	<1
1.58	toluene	50
1.72	phenol (tentative)	NQ
1.86	ethylbenzene	8
2.02	benzaldehyde	20
2.14	m- and/or p-xylene	14
2.20	o-xylene	18
2.30	benzofuran	3
2.37	o-methylstyrene (tentative)	NQ
2.41	o-ethyltoluene	5
2.46	acetophenone (tentative)	NQ
2.56	indene	7
2.76	trimethylbenzene isomer	∿1
2.82	trimethylbenzene isomer	∿2

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F101. LAWRENCE LIVERMORE SAMPLE #021478-WS-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.08	acetonitrile	450
0.17	methylene chloride	37
0.21	acetone	46
0.70	thiophene	<1
0.96	benzene	21
1.00	1,2-DIBROMOETHANE	IS
1.25	methylthiophene isomer	<1
1.28	methylthiophene isomer	<1
1.57	toluene	5
1.77	3-heptanone	<1
1.83	ethylbenzene	<1
1.95	air + column artifact	
1.97	benzaldehyde	28
2.08	styrene	2
2.11	m- and/or p-xylene	<1
2.14	o-xylene	1
2.16	2-ethyl-1-hexanol (tentative)	NQ
2.19	column artifact	
2.22	branched alkane (tentative)	NQ
2.24	benzofuran	<1
2.31	C_9H_{10} isomer (tentative)	NQ
2.37	naphthalene (tentative)	NQ
2.38	noise spike	
2.40	column artifact	
2.50	indene	2
2.83	unknown	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F102. LAWRENCE LIVERMORE SAMPLE #021478-WS-3 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	acetonitrile	1100
0.13	methylene chloride	blank contaminant
0.18	dimethyl sulfide (tentative)	NQ
0.69	thiophene	8
0.95	benzene	410
1.00	1,2-DIBROMOETHANE	IS
1.28	methylthiophene isomer	∿2
1.30	methylthiophene isomer	∿2
1.59	toluene	150
1.64	C_6H_8S isomer (tentative)	NQ
1.87	ethylbenzene	25
1.89	dimethylthiophene isomer (tentative)	NQ
1.94	dimethylthiophene isomer (tentative)	NQ
2.16	m- and/or p-xylene	36
2.21	o-xylene	51
2.32	benzofuran	6
2.39	o-methylstyrene (tentative) +	NQ
2.44	C_9H_{12} isomer	∿2
2.44	o-ethyltoluene	11
2.47	naphthalene (tentative)	NQ
2.58	C_9H_8 isomer (tentative)	NQ
2.63	$C_{10}H_{12}$ isomer (tentative)	NQ
2.67	trimethylbenzene isomer	<1
2.78	C_9H_{12} isomer	∿3
2.83	trimethylbenzene isomer	∿5

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F103. LAWRENCE LIVERMORE SAMPLE #021478-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	methylene chloride	11
0.39	chloroform	<1
0.51	2-butanone	2000
0.68	thiophene	51
0.77	dimethyl disulfide (tentative)	NQ
0.91	C_6H_{10} isomer (tentative)	NQ
0.94	benzene	4900
1.00	1,2-DIBROMOETHANE	IS
1.25	methylthiophene isomer	~17
1.25	methylthiophene isomer	~79
1.56	toluene	6400
1.61	ethylthiophene isomer (tentative) + unknown	NQ
1.84	ethylbenzene	680
1.92	dimethylthiophene isomer (tentative)	NQ
1.98	C_9H_{12} isomer	~11
1.99	n-octane	580
2.11	m- and/or p-xylene	520
2.17	o-xylene	600
2.22	n-propylbenzene	44
2.27	benzofuran	75
2.35	o-methylstyrene (tentative) + C_9H_{12} isomer	NQ ~83
2.39	o-ethyltoluene	400
2.41	n-nonane	>20000
2.43	$C_7H_{10}S$ isomer (tentative) + $C_{10}H_{14}$ isomer	NQ ~15
2.47	$C_{10}H_{14}$ isomer	~51
2.52	indene	180
2.58	$C_{10}H_{12}$ isomer (tentative) + $C_{10}H_{14}$ isomer	NQ ~14
2.62	trimethylbenzene isomer	~3
2.67	$C_{10}H_{12}$ isomer (tentative) + $C_8H_{12}S$ isomer (tentative)	NQ NQ
2.73	trimethylbenzene isomer	~130
2.77	trimethylbenzene isomer	~140
2.88	n-decane (tentative)	NQ
2.93	$C_{10}H_{14}$ isomer	~23
2.98	$C_{10}H_{12}$ isomer (tentative)	NQ
3.06	$C_{10}H_{12}$ isomer (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F104. LAWRENCE LIVERMORE SAMPLE #021478-WS-8 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	methylene chloride	2
0.40	cyclopentene (tentative)	NQ
0.69	thiophene	7
0.93	methylcyclopentene (tentative)	NQ
0.96	benzene	2800
1.00	1,2-DIBROMOETHANE	IS
1.28	methylthiophene isomer	<1
1.30	methylthiophene isomer	∿3
1.43	C_7H_{12} isomer (tentative)	NQ
1.59	toluene	820
1.63	C_8H_{14} isomer (tentative)	NQ
1.87	ethylbenzene	160
1.95	dimethylthiophene isomer (tentative)	NQ
2.01	C_9H_{12} isomer	∿2
2.16	m- and/or p-xylene	230
2.21	o-xylene	220
2.26	n-propylbenzene	24
2.39	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿14
2.43	o-ethyltoluene	140
2.47	$C_7H_{10}S$ isomer (tentative) + column artifact	NQ
2.53	$C_{10}H_{14}$ isomer	∿9
2.54	naphthalene (tentative)	NQ
2.62	$C_{10}H_{12}$ isomer (tentative)	NQ
2.66	C_9H_{12} isomer	∿5
2.72	$C_{10}H_{12}$ isomer (tentative) +	NQ
	$C_8H_{12}S$ isomer (tentative)	NQ
2.78	trimethylbenzene isomer	∿24

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F105. LAWRENCE LIVERMORE SAMPLE #041078-A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	acetonitrile	110
0.12	methylene chloride	blank contaminant
0.22	carbon disulfide	<1
0.69	thiophene	2
0.96	benzene	52
1.00	1,2-DIBROMOETHANE	IS
1.28	methylthiophene isomer	<1
1.30	methylthiophene isomer	<1
1.60	toluene	13
1.63	C_6H_8S isomer (tentative)	NQ
1.87	ethylbenzene	3
1.95	dimethylthiophene isomer (tentative)	NQ
2.02	column artifact	
2.04	benzaldehyde	19
2.17	m- and/or p-xylene	3
2.22	o-xylene	6
2.34	p-dichlorobenzene	3
2.39	o-methylstyrene (tentative) +	NQ
2.44	C_9H_{12} isomer	<1
2.45	o-ethyltoluene	<1
2.45	naphthalene (tentative)	NQ
2.47	ethyltoluene isomer	∿2
2.58	indene	2
2.77	unknown	
2.78	trimethylbenzene isomer + column artifact	<1
2.83	trimethylbenzene isomer + column artifact	∿1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F106. LAWRENCE LIVERMORE SAMPLE #041178-B VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	acetonitrile	220
0.15	methylene chloride	1
0.20	acetone	120
0.24	carbon disulfide	<1
0.26	unknown	
0.53	2-butanone	37
0.70	thiophene	<1
0.77	unknown	
0.95	benzene	16
1.00	1,2-DIBROMOETHANE	IS
1.28	methylthiophene isomer	<1
1.54	toluene	18
1.80	ethylbenzene	5
2.05	m- and/or p-xylene	8
2.11	o-xylene	13
2.13	unknown	
2.15	n-propylbenzene	47
2.20	unknown	
2.27	o-methylstyrene + (tentative)	NQ
	C_9H_{12} isomer	<1
2.31	ethyltoluene isomer	~1
2.37	C_9H_{12} isomer	<1
2.50	indene	<1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F107. LAWRENCE LIVERMORE SAMPLE #041078-WS-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.07	acetonitrile	520
0.15	methylene chloride	<1
0.20	acetone	blank contaminant
0.24	carbon disulfide	<1
0.45	chloroform	<1
0.70	thiophene	4
0.96	benzene	95
1.00	1,2-DIBROMOETHANE	IS
1.54	toluene	1
1.81	ethylbenzene	<1
1.95	unknown	
2.10	o-xylene	6
2.22	benzofuran	<1
2.27	C_9H_{10} isomer (tentative)	NQ
2.31	C_9H_{12} isomer	<1
2.37	C_9H_{12} isomer	∿1
2.50	indene	2

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F108. LAWRENCE LIVERMORE SAMPLE #041078-WS-3 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.10	acetonitrile	210
0.17	methylene chloride	<1
0.22	dimethyl sulfide (tentative)	NQ
0.26	carbon disulfide	<1
0.70	thiophene	4
0.95	benzene	240
1.00	1,2-DIBROMOETHANE	IS
1.26	methylthiophene isomer	<1
1.28	methylthiophene isomer	<1
1.54	toluene	56
1.59	C_6H_8S isomer (tentative)	NQ
1.80	dimethylthiophene isomer (tentative)	NQ
1.81	ethylbenzene	13
1.87	dimethylthiophene isomer (tentative)	NQ
1.94	C_8H_8O isomer (tentative) + column artifact	NQ
2.07	m- and/or p-xylene	16
2.10	o-xylene	24
2.15	n-propylbenzene	1
2.20	benzofuran	1
2.28	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿3
2.32	o-ethyltoluene	6
2.43	$C_{10}H_{14}$ isomer + column artifact	∿2
2.50	indene	4

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F109. LAWRENCE LIVERMORE SAMPLE #041078-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	air	
0.19	acetonitrile	3100
0.26	methylene chloride	9
0.30	acetone	760
0.35	C_4H_6 isomer (tentative)	NQ
0.51	chloroform	<1
0.56	2-methylpropanenitrile (tentative)	NQ
0.66	butanenitrile (tentative)	NQ
0.74	thiophene	4
0.80	3-methyl-2-butanone	270
0.82	dimethyl disulfide (tentative)	NQ
0.83	$C_5H_{10}O$ isomer	~71
0.91	trichloroethylene	<1
0.96	benzene	24
1.00	1,2-DIBROMOETHANE	IS
1.11	2-methylthiacyclopentane (tentative)	NQ
1.12	3-methyl-2-pentanone	~110
1.14	$C_6H_{12}O$ isomer	~40
1.20	$C_6H_{12}O$ isomer	~79
1.23	methylthiophene isomer	~1
1.25	methylthiophene isomer	~2
1.29	methylpentanenitrile isomer (tentative)	NQ
1.49	toluene	34
1.53	unknown	
1.56	3-heptanone	~2
1.72	ethylbenzene	<1
1.73	dimethylthiophene isomer (tentative)	NQ
1.83	C_8 alkane + column artifact	~75
1.85	trimethylcyclohexanone isomer (tentative)	NQ
1.89	$C_8H_{16}O$ isomer	~24
1.96	m- and/or p-xylene	4
2.00	o-xylene	28
2.11	benzofuran	67
2.14	$C_{10}H_{22}$ isomer (tentative)	NQ
2.19	o-methylstyrene (tentative)	NQ
2.22	C_9H_{12} isomer	<1
2.26	o-ethyltoluene	19
2.31	$C_7H_{10}S$ isomer (tentative)	NQ
2.38	$C_{10}H_{14}$ isomer	~4
2.48	indene	14
2.57	$C_{10}H_{12}$ isomer (tentative)	NQ
2.68	C_9H_{12} isomer	~3
2.77	$C_{10}H_{12}$ isomer (tentative)	NQ

(Continued)

TABLE F109. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
2.90	naphthalene (tentative) + unknown + C_9H_{12} isomer	NQ ∿4
3.01	trimethylbenzene isomer	∿19
3.04	trimethylbenzene isomer	∿3

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F110. LAWRENCE LIVERMORE SAMPLE #041078-WS-8 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	<1
0.20	acetone +	21
	dimethyl sulfide (tentative)	NQ
0.24	carbon disulfide +	<1
	C_4H_8 isomer (tentative)	NQ
0.42	cyclopentene (tentative)	NQ
0.60	C_5H_{10} isomer (tentative)	NQ
0.70	thiophene	8
0.80	C_6H_{10} isomer (tentative)	NQ
0.92	methylcyclopentene isomer (tentative)	NQ
0.95	benzene	1500
1.00	1,2-DIBROMOETHANE	IS
1.09	n-hexane	19
1.26	methylthiophene isomer	∿1
1.28	methylthiophene isomer	∿1
1.38	2-methyl-1,4-hexadiene (tentative)	NQ
1.54	toluene	170
1.59	C_8H_{14} isomer (tentative)	NQ
1.80	ethylbenzene	72
1.87	C_9H_{10} isomer (tentative)	NQ
1.94	C_9H_8O isomer +	∿52
	$C_{10}H_{14}$ isomer +	∿12
	column artifact	
2.06	m- and/or p-xylene	120
2.11	o-xylene	150
2.14	$C_{10}H_{12}$ isomer (tentative)	NQ
2.20	C_9H_{10} isomer (tentative) +	NQ
	$C_{10}H_{12}$ isomer (tentative)	NQ
2.27	o-methylstyrene (tentative) + C_9H_{12} isomer	∿37
2.31	o-ethyltoluene	85
2.37	$C_{10}H_{14}$ isomer +	∿11
	n-pentylbenzene (tentative)	NQ
2.43	$C_{10}H_{14}$ isomer	∿48
2.49	indene	73

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F111. LAWRENCE LIVERMORE SAMPLE #061378-A VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.13	acetonitrile	74
0.38	carbon disulfide	<1
0.73	thiophene	2
0.94	benzene	110
1.00	1,2-DIBROMOETHANE	IS
1.21	methylthiophene isomer	<1
1.22	methylthiophene isomer	<1
1.43	toluene	11
1.47	ethylthiophene isomer (tentative)	NQ
1.63	ethylbenzene	3
1.85	m- and/or p-xylene	3
1.87	o-xylene	9
2.05	o-methylstyrene (tentative)	NQ
2.09	unknown	
2.29	indene	<1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F112. LAWRENCE LIVERMORE SAMPLE #061378-WS-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.16	methylene chloride	<1
0.26	carbon disulfide	<1
0.47	chloroform	<1
0.73	thiophene	4
0.94	benzene	230
1.00	1,2-DIBROMOETHANE	IS
1.43	toluene	1
1.63	ethylbenzene	2

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F113. LAWRENCE LIVERMORE SAMPLE #061378-WS-2 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.02	air	
0.05	air	
0.20	acetonitrile	910
0.26	methylene chloride	<1
0.30	acetone	170
0.33	carbon disulfide	<1
0.51	chloroform	<1
0.57	noise spike	
0.96	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.36	noise spike	
1.48	toluene	<1
1.71	ethylbenzene	1
1.82	column artifact	
1.95	m- and/or p-xylene	3
1.99	o-xylene	5
2.04	n-propylbenzene	<1
2.14	air spike	
2.19	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿5
2.24	o-ethyltoluene	6
2.31	column artifact	
2.36	$C_{10}H_{14}$ isomer	∿8
2.55	$C_{10}H_{12}$ isomer (tentative)	NQ
2.69	trimethylbenzene isomer	<1
2.74	$C_{10}H_{12}$ isomer (tentative)	NQ
2.87	C_9H_{12} isomer	∿16
2.96	C_9H_{12} isomer	∿28
3.09	noise spike	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F114. LAWRENCE LIVERMORE SAMPLE #061378-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	unknown	
0.32	carbon disulfide	2
0.48	cyclopentene (tentative)	NQ
0.58	unknown	
0.73	thiophene	42
0.81	2,4-hexadiene (tentative)	NQ
0.94	benzene	2700
1.00	1,2-DIBROMOETHANE	IS
1.24	methylthiophene isomer	∿23
1.25	methylthiophene isomer	∿97
1.36	2-methyl-1,4-hexadiene (tentative)	NQ
1.48	toluene	11000
1.54	ethylthiophene isomer (tentative)	NQ
1.74	ethylbenzene	210
1.80	2,5-dimethylthiophene (tentative)	NQ
1.86	C_9H_{12} isomer	∿14
1.95	m- and/or p-xylene	1000
1.99	o-xylene	1500
2.03	2-isopropylthiophene (tentative)	NQ
2.12	benzofuran	840
2.19	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿190
2.25	ethyltoluene isomer	∿490
2.31	trimethylthiophene isomer (tentative)	NQ
2.38	$C_{10}H_{14}$ isomer	∿81
2.48	indene	470
2.56	$C_{10}H_{12}$ isomer (tentative)	NQ
2.63	C_9H_{12} isomer	∿56
2.73	unknown	
2.83	trimethylbenzene isomer	∿410

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F115. LAWRENCE LIVERMORE HOE CREEK SAMPLE #061378-WS-6 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.17	acetonitrile	410
0.29	dimethyl sulfide (tentative)	NQ
0.34	unknown	
0.48	cyclopentene (tentative)	NQ
0.58	2-butanone	980
0.73	thiophene	88
0.81	3-methyl-2-butanone	200
0.83	dimethyl disulfide (tentative)	NQ
0.93	benzene	6900
1.00	1,2-DIBROMOETHANE	IS
1.24	2-methylthiophene	~29
1.25	3-methylthiophene	~110
1.36	2-methyl-1,4-hexadiene (tentative)	NQ
1.49	toluene	9300
1.54	ethylthiophene isomer (tentative)	NQ
1.69	unknown	
1.76	ethylbenzene	330
1.80	dimethylthiophene isomer (tentative)	NQ
1.86	ethyltoluene isomer	~9
1.88	n-octane	1800
1.92	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
1.96	m- and/or p-xylene	1100
1.99	o-xylene	130
2.04	$C_7H_{10}S$ isomer (tentative)	NQ
2.06	phenylacetaldehyde	>20000
2.12	benzofuran	160
2.15	alkane (tentative) + unknown	NQ
2.20	o-methylstyrene (tentative) + C_9H_{12} isomer	NQ ~160
2.25	ethyltoluene isomer	~180
2.30	n-nonane	>20000
2.38	$C_{10}H_{14}$ isomer	~140
2.48	indene	750
2.57	ethylstyrene isomer (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F116. LAWRENCE LIVERMORE HOE CREEK SAMPLE #061378-WS-8 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.30	dimethyl sulfide (tentative)	NQ
0.49	cyclopentene (tentative)	NQ
0.73	thiophene	7
0.80	1-methylcyclopentene (tentative)	NQ
0.96	benzene	430
1.00	1,2-DIBROMOETHANE	IS
1.23	unknown	
1.35	2-methyl-1,4-hexadiene (tentative) + unknown	NQ
1.49	toluene	35
1.53	unknown	
1.73	ethylbenzene	7
1.84	4-methyl-(2,3-dihydroindene) (tentative)	NQ
1.91	$C_{10}H_{12}$ isomer (tentative)	NQ
1.96	m- and/or p-xylene	24
2.00	o-xylene	55
2.10	benzofuran + unknown	∿9
2.19	o-methylstyrene (tentative)	NQ
2.25	ethyltoluene isomer	∿56
2.31	$C_{10}H_{14}$ isomer	∿6
2.37	unknown	
2.49	indene	52
2.57	$C_{10}H_{12}$ isomer (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F117. LAWRENCE LIVERMORE SAMPLE #092178-WS-1 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	air	
0.20	acetonitrile	32
0.26	methylene chloride	<1
0.31	acetone	blank contaminant
0.34	carbon disulfide	<1
0.74	thiophene	<1
0.97	benzene	68
1.00	1,2-DIBROMOETHANE	IS
1.49	toluene	blank contaminant
1.73	ethylbenzene	<1
1.85	column artifact	
1.87	benzaldehyde	16
2.02	m- and/or p-xylene	<1
2.06	C_7H_7Cl isomer	blank contaminant
2.14	C_7H_7Cl isomer	blank contaminant
2.20	o-methylstyrene (tentative)	NQ
2.32	column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F118. LAWRENCE LIVERMORE SAMPLE #092178-WS-3 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	acetonitrile	150
0.27	methylene chloride	58
0.31	acetone	2
0.34	carbon disulfide	<1
0.52	chloroform	4
0.75	thiophene	2
0.97	benzene	82
1.00	1,2-DIBROMOETHANE	IS
1.24	methylthiophene isomer	<1
1.25	methylthiophene isomer	<1
1.50	toluene	17
1.53	ethylthiophene isomer (tentative)	NQ
1.72	ethylbenzene	4
1.75	C_6H_8S isomer (tentative)	NQ
1.79	C_6H_8S isomer (tentative)	NQ
1.84	column artifact	
1.94	styrene	<1
1.97	m- and/or p-xylene	3
2.00	o-xylene	10
2.20	o-methylstyrene (tentative)	NQ
2.25	o-ethyltoluene	1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F119. LAWRENCE LIVERMORE SAMPLE #092178-WS-5 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	dimethyl sulfide (tentative)	NQ
0.34	carbon disulfide	<1
0.42	cyclopentane (tentative)	NQ
0.49	cyclopentene (tentative)	NQ
0.64	C_5H_{10} isomer (tentative)	NQ
0.73	thiophene	<1
0.76	cyclohexane	25
0.93	methylcyclopentene isomer (tentative)	NQ
0.96	benzene	610
1.00	1,2-DIBROMOETHANE	NQ
1.12	methylcyclohexane	1
1.14	C_7H_{12} isomer (tentative)	NQ
1.17	C_7H_{12} isomer (tentative)	NQ
1.22	C_7H_{12} isomer (tentative)	NQ
1.34	C_7H_{12} isomer (tentative)	NQ
1.48	toluene	19
1.52	C_8H_{14} isomer (tentative)	NQ
1.56	C_8H_{14} isomer (tentative)	NQ
1.62	C_8H_{14} isomer (tentative)	NQ
1.81	column artifact	
1.87	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ
2.00	m- and/or p-xylene	8
2.17	o-methylstyrene (tentative)	NQ
2.22	o-ethyltoluene	17
2.28	$C_{10}H_{14}$ isomer	∿2
2.34	$C_{10}H_{14}$ isomer	∿3

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F120. LAWRENCE LIVERMORE SAMPLE #092178-WS-6 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.26	methylene chloride	4
0.30	dimethyl sulfide (tentative)	NQ
0.31	acetone	110
0.34	carbon disulfide	<1
0.42	C_5H_{10} isomer (tentative)	NQ
0.49	cyclopentene (tentative)	NQ
0.50	chloroform	<1
0.59	2-butanone +	110
0.64	unknown	
	C_5H_{10} isomer (tentative)	NQ
0.72	thiophene	4
0.80	dimethyl disulfide (tentative)	NQ
0.94	benzene	6100
1.00	1,2-DIBROMOETHANE	IS
1.02	C_6H_{12} isomer (tentative)	NQ
1.07	2-methylthiacyclopentane (tentative)	NQ
1.12	unknown	
1.16	C_7H_{12} isomer (tentative)	NQ
1.20	methylthiophene isomer	∿10
1.21	methylthiophene isomer	∿21
1.32	C_7H_{12} isomer (tentative)	NQ
1.45	toluene	3100
1.48	ethylthiophene isomer (tentative)	NQ
1.60	C_8H_{14} isomer (tentative)	NQ
1.67	ethylbenzene	750
1.75	dimethylthiophene isomer (tentative)	NQ
1.79	isopropylbenzene	∿9
1.83	trimethylcyclohexane isomer (tentative)	NQ
1.90	m- and/or p-xylene	310
1.94	o-xylene	410
2.00	n-propylbenzene	40
2.05	benzofuran	33
2.14	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿75
2.19	o-ethyltoluene	430
2.25	$C_7H_{10}S$ isomer (tentative)	NQ
2.31	$C_{10}H_{14}$ isomer	∿49

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F121. LAWRENCE LIVERMORE SAMPLE #092178-WS-8 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.25	acetone	blank contaminant
0.27	methylene chloride	<1
0.31	dimethyl sulfide (tentative)	NQ
0.36	carbon disulfide	<1
0.43	cyclopentane (tentative)	NQ
0.50	cyclopentene (tentative)	NQ
0.74	thiophene	<1
0.76	cyclohexane	3
0.82	cyclohexene (tentative)	NQ
0.94	noise spike	
0.97	benzene	30
1.00	1,2-DIBROMOETHANE	IS
1.13	noise spike	
1.15	C_7H_{12} isomer (tentative)	NQ
1.18	C_7H_{12} isomer (tentative)	NQ
1.24	C_7H_{12} isomer (tentative)	NQ
1.35	C_7H_{12} isomer (tentative)	NQ
1.53	C_8H_{14} isomer (tentative)	NQ
1.65	unknown	
1.83	column artifact	
1.89	2,3,4,5-tetramethyl-hexa-1,4-diene (tentative)	NQ

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F122. LAWRENCE LIVERMORE SAMPLE #113178-WS-10 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.04	air	
0.21	acetonitrile	2500
0.27	methylene chloride	80
0.32	acetone	3000
0.35	unknown	
0.36	propanenitrile (tentative)	NQ
0.47	tetrahydrofuran	270
0.52	chloroform	17
0.60	2-butanone	1500
0.74	thiophene	49
0.79	C_5H_6O isomer (tentative)	NQ
0.83	dimethyl disulfide (tentative)	NQ
0.97	benzene	2700
1.00	1,2-DIBROMOETHANE	IS
1.16	$C_6H_8N_2$ isomer (tentative)	NQ
1.21	2-methyl-3-pentanone	∿68
1.25	methylthiophene isomer	∿15
1.27	methylthiophene isomer	∿35
1.37	C_7H_{12} isomer (tentative)	NQ
1.50	toluene	1100
1.54	ethylthiophene isomer (tentative)	NQ
1.79	ethylbenzene	300
1.79	dimethylthiophene isomer (tentative)	NQ
1.82	dimethylthiophene isomer (tentative)	NQ
1.87	isopropylbenzene	∿5
1.95	$C_7H_{10}S$ isomer (tentative)	NQ
1.99	m- and/or p-xylene	370
2.03	o-xylene	440
2.08	n-propylbenzene	28
2.13	benzofuran	53
2.22	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿44
2.28	o-ethyltoluene	99
2.34	$C_7H_{10}S$ isomer (tentative) +	NQ
	$C_{10}H_{14}$ isomer	∿3
2.40	$C_{10}H_{14}$ isomer	∿28

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F123. LAWRENCE LIVERMORE SAMPLE #113178-WS-12 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.22	acetonitrile	64
0.28	methylene chloride	62
0.32	acetone	840
0.35	carbon disulfide	<1
0.43	cyclopentane (tentative)	NQ
0.47	tetrahydrofuran	110
0.52	chloroform	9
0.53	cyclopentadiene (tentative)	NQ
0.58	1,2-dichloroethane	<1
0.61	2-butanone	110
0.67	C_5H_{10} isomer (tentative)	NQ
0.70	3-methyl-2-pentanone	15
0.75	thiophene	18
0.78	C_6H_{12} isomer	∿2
0.82	dimethyl disulfide (tentative)	NQ
0.95	methylcyclopentene isomer (tentative)	NQ
0.99	benzene	1800
1.00	1,2-DIBROMOETHANE	IS
1.20	2-methyl-1,4-hexadiene (tentative)	NQ
1.25	methylthiophene isomer	∿2
1.27	methylthiophene isomer	∿2
1.37	3-methyl-2,4-hexadiene (tentative)	NQ
1.51	toluene	170
1.54	dimethyl-2,4-hexadiene isomer (tentative)	NQ
1.74	ethylbenzene	3
1.76	dimethylthiophene isomer (tentative)	NQ
1.81	dimethylthiophene isomer (tentative)	NQ
1.91	unknown	
1.94	$C_7H_{10}S$ isomer (tentative)	NQ
1.98	m- and/or p-xylene	850
2.03	o-xylene	900
2.13	benzofuran	11
2.22	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿33
2.28	o-ethyltoluene	410
2.34	$C_{10}H_{14}$ isomer	∿23
2.40	$C_{10}H_{14}$ isomer	∿82

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F124. LAWRENCE LIVERMORE LIQUID CONDENSATE SAMPLE #LC-01-12-77 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	acetonitrile	>20000
0.27	methylene chloride	250
0.31	acetone	>20000
0.35	carbon disulfide	39
0.37	propanenitrile (tentative)	NQ
0.60	2-butanone	>20000
0.74	thiophene	120
0.81	pyrrole (tentative)	NQ
0.86	dihydropyran	500
0.94	2-pentanone	8600
0.97	benzene	11000
1.00	1,2-DIBROMOETHANE	IS
1.22	methylthiophene isomer	∿62
1.24	methylthiophene isomer	∿150
1.40	C_6H_7N isomer (tentative)	NQ
1.48	toluene	>20000
1.51	ethylthiophene isomer (tentative)	NQ
1.64	phenol (tentative)	NQ
1.70	ethylbenzene	9100
1.75	dimethylthiophene isomer (tentative)	NQ
1.78	dimethylpyridine isomer (tentative)	NQ
1.80	C_9H_{12} isomer	∿390
1.82	n-octane	>20000
1.86	unknown	
1.92	m- and/or p-xylene	>20000
1.97	o-xylene	17800
2.01	n-propylbenzene	5300
2.07	benzofuran +	3400
	naphthalene (tentative)	NQ
2.09	naphthalene (tentative)	NQ
2.16	o-methylstyrene (tentative) +	NQ
	C_9H_{12} isomer	∿6400
2.18	ethyltoluene isomer	∿9500
2.21	ethyltoluene isomer	∿9700

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F125. LAWRENCE LIVERMORE LIQUID CONDENSATE SAMPLE #LC-30-10-77 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.22	acetonitrile	>20000
0.28	methylene chloride	67
0.32	acetone	>20000
0.37	propanenitrile (tentative)	NQ
0.61	2-butanone	>20000
0.76	thiophene	190
0.82	pyrrole (tentative)	NQ
0.87	dihydropyran	1400
0.96	2-pentanone	19000
0.98	benzene	13000
1.00	1,2-DIBROMOETHANE	IS
1.15	3-methylcyclopentanone	>20000
1.23	methylthiophene isomer	∿89
1.25	methylthiophene isomer	∿260
1.35	$C_6H_{12}O$ isomer + unknown	∿670
1.43	C_6H_7N isomer (tentative)	NQ
1.50	toluene	>20000
1.53	ethylthiophene isomer (tentative)	NQ
1.62	phenol (tentative)	NQ
1.72	ethylbenzene	14000
1.78	dimethylthiophene isomer (tentative)	NQ
1.83	ethyltoluene isomer	∿620
1.86	n-octane	11600
1.96	m- and/or p-xylene	>20000
2.00	o-xylene	>20000
2.05	n-propylbenzene	4900
2.10	benzofuran	3700
2.19	o-methylstyrene (tentative) + C_9H_{12} isomer	NQ ∿7900
2.25	ethyltoluene isomer	∿10000
2.31	$C_7H_{10}S$ isomer (tentative) + $C_{10}H_{14}$ isomer	NQ ∿1200

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F126. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE UCG-011 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
10*	Methylene chloride	430
46	Blank contaminant	
58	Trans 1,2-dichloroethylene	24
86	Chloroform	<1
105	Blank contaminant	
126	Cyclohexane (tentative)	NQ
196	Benzene	<1
204	Unknown	
297	1,1,2,2-tetrachloroethene	1
325	Toluene	3
411	Blank contaminant	

*An internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F127. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-004 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
28*	Methylene chloride	7
35	Unknown	
48	Carbon Disulfide (tentative)	NQ
65	Trans-1,2-dichloroethylene	7
93	Chloroform	1
115	Blank contaminant	
205	Benzene	15
233	N-hexane (tentative)	NQ
304	1,1,2,2-tetrachloroethene	<1
335	Toluene	1
410	Blank contaminant	
418	Unknown	
515	Septum bleed contaminant	
580	Unknown	

*An internal standard was not added to the samples. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F128. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-007 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
22*	Methylene chloride	17
41	Blank contaminant	
50	Carbon disulfide (tentative)	NQ
55	Unknown	
87	Chloroform	15
103	Blank contaminant	
112	Cyclobutanol (tentative)	NQ
202	Benzene	4
231	N-hexane (tentative)	NQ
258	Unknown	
303	1,1,2,2-tetrachloroethene	3
317	C_9H_8O isomer	
330	Toluene	4
364	Di-sec-butoxymethane ($C_9H_{20}O_2$) (tentative)	NQ
403	Unknown	
410	Mixture-bis-(2-choroethyl)ether ($C_4H_8Cl_2O$) and di-n-butoxymethane ($C_9H_{20}O_2$) (tentative)	NQ
413	Blank contaminant	
515	Septum bleed contaminant	
550	$C_{14}H_{22}O$ isomer (phenol derivative) (tentative)	NQ
565	$C_{14}H_{22}O$ isomer (phenol derivative) (tentative)	NQ
590	$C_{14}H_{22}O$ isomer (phenol derivative) (tentative)	NQ

*An internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F129. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-010 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
28*	Methylene chloride	10
40	Acetone (tentative)	NQ
59	Trans-1,2-dichloroethylene	2
85	Chloroform	<1
104	Blank contaminant	
110	Blank contaminant	
180	Substituted urea (N-nitroso-1, 1-diemthyl-3-ethyl urea) ($C_5H_{11}N_3O_2$)	
196	Benzene	1
227	Unknown	
250	Monthiol Triethylene Glycol($C_6H_{14}O_3S$) (tentative)	NQ
273	N-butyl vinyl ether ($C_6H_{12}O$) (tentative)	NQ
311	Unknown	
325	Toluene	1
357	Di-sec-butoxymethane($C_9H_{20}O_2$)	NQ
396	Unknown	
402	Mixture-bis-(2-chloroethyl)ether ($C_4H_8Cl_2O$) and di-n-butoxymethane ($C_9H_{20}O_2$) (tentative)	NQ
412	Blank contaminant	
456	Unknown	
494	Silicon derivative	
515	Ethyldimethylamine (tentative)	NQ
533	Unknown	
570	Benzothiazole(C_7H_5NS) (tentative)	NQ
624	Unknown	
645	Unknown	
680	Diethytbutylamine ($C_8H_{19}N$ isomer) (tentative)	NQ

*An internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F130. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-013 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
12*	Methylene chloride	11
24	Carbon disulfide (tentative)	NQ
48	Unknown	
53	Unknown	
87	Chloroform	4
104	Blank contaminant	
111	1,3,5 trioxane($C_3H_3O_3$) (tentative)	NQ
160	Unknown	
187	Substituted urea (N-nitroso-1, 1-dimethyl-3-ethylurea)($C_5H_{11}N_3O_2$) (tentative)	NQ
200	Benzene	3
237	N-methyl morpholine($C_5H_{11}NO$) (tentative)	NQ
255	Monothiol triethylene glycol ($C_6H_{14}O_3S$)(tentative)	NQ
283	N-butyl vinyl ether($C_6H_{12}O$) (tentative)	NQ
317	Unknown	
330	Toluene	2
345	Unknown	
361	Di-sec butoxy methane (tentative)	NQ
385	2,6 dihydroxy-1,4-benzoquinone($C_6H_4O_4$)(tentative)	NQ
395	Unknown	
400	Unknown	
410	Misture-bis-(2-chloroethyl)either($C_4H_8Cl_2O$) di-n-butoxymethane($C_9H_{20}O_2$)(tentative)	NQ
416	Blank contaminant	
445	2 methyl-2-hyxanethiol($C_7H_{16}S$)(tentative)	NQ
460	Unknown	
487	Unknown	
497	Unknown	
504	Substituted urea-1,1,3,3 tetramethyl urea (tentative)	NQ
512	septum bleed contaminant($C_9H_{20}O_2N$)	
521	Methylisopropylamine($C_4H_{11}N$) (tentative)	NQ
541	Unknown	
585	1-(2-butoxy ethoxy)ethanol($C_8H_{18}O_3$)(tentative)	NQ
630	Unknown	
655	Silicon derivative	
685	Unknown	

*An internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standards, the scan numbers at which the compounds eluted have been noted.

TABLE F131. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-016 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
0.20	acetonitrile	>20000
0.28	methylene chloride	37
0.32	acetone	>13000
0.37	propanenitrile (tentative)	NQ
0.54	cyclopentadiene (tentative)	NQ
0.58	2-methylpropanenitrile (tentative)	NQ
0.60	2-butanone	>10000
0.67	butanenitrile (tentative)	NQ
0.75	thiophene	77
0.77	C_6H_{12} isomer	∿430
0.81	pyrrole (tentative)	NQ
0.86	dihydropyran	62
0.94	3-pentanone	∿2200
0.97	benzene	16000
1.00	1,2-DIBROMOETHANE	IS
1.04	unknown	
1.09	n-hexane	810
1.14	methylcyclopentanone isomer	∿6900
1.18	2-methylpyrrole (tentative)	NQ
1.22	methylthiophene isomer	∿15
1.24	methylthiophene isomer	∿29
1.29	3-hexanone	∿180
1.33	2-hexanone	400
1.40	C_6H_7N isomer (tentative)	NQ
1.50	toluene	6600
1.51	ethylthiophene isomer (tentative)	NQ
1.66	unknown	
1.70	ethylbenzene	190
1.76	dimethylthiophene isomer (tentative)	NQ
1.80	benzonitrile + column artifact	66
1.91	styrene	40
1.94	m- and/or p-xylene	490
1.98	o-xylene	590
2.02	n-propylbenzene	18
2.08	benzofuran	120
2.17	o-methylstyrene (tentative)	NQ
2.22	ethyltoluene isomer	∿60
2.29	trimethylthiophene isomer (tentative)	NQ

TABLE F132. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-019 VOA.

Retention Time (scan numbers)	Compound Identification	Concentration (ppb)
0.20	acetonitrile	∿6700
0.27	methylene chloride	180
0.31	acetone	>12000
0.37	propanenitrile (tentative)	NQ
0.52	cyclopentadiene (tentative)	NQ
0.57	2-methylpropanenitrile (tentative)	NQ
0.60	2-butanone	>12000
0.66	butanenitrile (tentative)	NQ
0.70	cyclohexane	160
0.74	thiophene	44
0.77	C_6H_{12} isomer	∿6000
0.80	pyrrole (tentative)	NQ
0.86	dihydropyran	120
0.93	2-pentanone	2400
0.96	benzene	8500
1.00	1,2-DIBROMOETHANE	IS
1.03	unknown	
1.09	n-hexane	>4500
1.12	cyclohexanone	2700
1.17	2-methylpyrrole (tentative)	NQ
1.21	methylthiophene isomer	∿12
1.23	methylthiophene isomer	∿22
1.28	3-hexanone	66
1.32	2-hexanone	∿250
1.39	C_6H_7N isomer (tentative)	NQ
1.47	toluene	4400
1.51	ethylthiophene isomer (tentative)	NQ
1.55	phenol (tentative)	NQ
1.61	C_6H_7N isomer (tentative)	NQ
1.63	C_6H_7N isomer (tentative) + unknown	NQ
1.68	ethylbenzene	150
1.75	dimethylthiophene isomer (tentative)	NQ
1.78	dimethylpyridine isomer (tentative)	NQ
1.90	methylphenol isomer (tentative) +	NQ
	styrene	∿43
1.92	m- and/or p-xylene	440
1.97	o-xylene	460
2.01	n-propylbenzene	23
2.06	benzofuran	180
2.16	o-methylstyrene (tentative) +	∿53
	C_9H_{12} isomer	53
2.21	ethyltoluene isomer	∿75
2.27	$C_7H_{10}S$ isomer (tentative)	NQ

TABLE F133. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-2-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.31	air	
0.94	benzene	3
1.00	1,2-DIBROMOETHANE	IS
1.43	toluene	<1
1.88	column artifact	
2.03	column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F134. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-6-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.32	unknown	
1.00	1,2-DIBROMOETHANE	IS

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F135. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-7- VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	1,2-DIBROMOETHANE	IS
1.75	column artifact	
1.88	column artifact	
2.04	unknown	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F136. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-8-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	1,2-DIBROMOETHANE	IS
1.75	column artifact	
2.05	unknown	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F137. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-9-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	unknown	
1.00	1,2-DIBROMOETHANE	IS
1.75	column artifact	
1.85	column artifact	
1.94	column artifact	
2.05	unknown	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F138. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-10-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	1,2-DIBROMOETHANE	IS
1.80	column artifact	
2.06	column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F139. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-11-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	1,2-DIBROMOETHANE	IS
1.75	column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F140. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-12-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.30	acetone	<1
0.35	carbon disulfide	<1
0.96	benzene	<1
1.00	1,2-DIBROMOETHANE	IS
1.49	toluene	<1
1.83	unknown + column artifact	
2.03	C_7H_7Cl isomer (tentative)	blank contaminant
2.11	C_7H_7Cl isomer (tentative)	blank contaminant

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F141. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-13-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.05	air	
0.30	acetone	blank contaminant
0.33	carbon disulfide	<1
1.00	1,2-DIBROMOETHANE	IS
1.50	toluene	blank contaminant
1.85	column artifact	
1.87	benzaldehyde	11
2.07	C_7H_7Cl isomer (tentative)	blank contaminant
2.14	C_7H_7Cl isomer (tentative)	blank contaminant

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F142. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-14-7 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.06	air	
0.30	acetone	<1
0.35	carbon disulfide	<1
1.00	1,2-DIBROMOETHANE	IS
1.48	toluene	blank contaminant
1.85	ethylbenzene	<1
2.05	C_7H_7Cl isomer (tentative)	blank contaminant
2.12	C_7H_7Cl isomer (tentative)	blank contaminant
2.16	column artifact	

*Relative to the internal standard 1,2-Dibromoethane.

TABLE F143. PITTSBURGH ENERGY TECHNOLOGY CENTER HG-2 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
33*	methanol	>100000
36	dichlorodifluoromethane (tentative)	NQ
52	ethanol (tentative)	NQ
61	methylene chloride	770
71	acetone	blank contaminant
79	isopropyl alcohol	>100000
86	trichlorofluoromethane	1200
105	C_4H_8O isomer	∿440
115	chloroform	450
129	1,2-dichloroethane	260
135	methyl ethyl ketone	blank contaminant
145	1,1,1-trichloroethane	360
150	carbon tetrachloride	1500
160	ethyl acetate	∿3500
172	methylcyclopentane	blank contaminant
210	trichloroethylene	7
221	benzene	blank contaminant
252	n-hexane	blank contaminant
262	methylcyclohexane	blank contaminant
324	1,1,2,2-tetrachloroethene	blank contaminant
350	toluene	blank contaminant

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F144. PITTSBURGH ENERGY TECHNOLOGY CENTER HG-9 VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ng/g)
54*	ethanol (tentative)	NQ
61	methylene chloride	4000
72	acetone	blank contaminant
78	isopropyl alcohol	∿22000
86	trichlorofluoromethane	510
92	1,2-dichloroethylene	37
104	C_4H_8O isomer	∿130
115	chloroform	3700
128	1,2-dichloroethane	370
134	methyl ethyl ketone	blank contaminant
144	1,1,1-trichloroethane	240
149	carbon tetrachloride	1500
159	ethyl acetate	∿350
171	methylcyclopentane	blank contaminant
209	trichloroethylene	220
220	benzene	670
252	n-hexane	blank contaminant
262	methylcyclohexane	blank contaminant
281	2-hexanone	blank contaminant
302	1,1,2,2-tetrachloroethane	blank contaminant
310	n-heptane	∿500
322	1,1,2,2-tetrachloroethene	blank contaminant
329	C_9H_{20} branched alkane	∿26000
348	toluene	blank contaminant
405	ethylbenzene	blank contaminant
461	m- and/or p-xylene	blank contaminant
470	o-xylene	blank contaminant
585	$C_{10}H_{22}$ branched alkane	blank contaminant

*Because of the nature of the trapping procedure, an internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE F145. LAWRENCE LIVERMORE SAMPLE #100477-WS-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	C_4H_9NO isomer (tentative)	NQ
0.39	$C_8H_{11}N$ isomer (tentative)	NQ
0.88	n-hexadecane	<1
0.93	C_{17} alkane	<1
0.96	n-heptadecane	<1
0.97	C_{18} alkane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	C_{19} alkane	<1
1.06	dibutyl phthalate isomer	<1
1.11	n-nonadecane	<1
1.13	dibutyl phthalate isomer	<1
1.18	n-eicosane	<1
1.22	unknown	<1
1.25	n-heneicosane	<1
1.31	n-docosane	<1
1.37	n-tricosane	<1
1.43	n-tetracosane	<1
1.49	n-pentacosane	<1
1.50	bis-(2-ethylhexyl) phthalate	<1
1.66	unknown mixture	

*Relative to the internal standard D-10 anthracene.

TABLE F146. LAWRENCE LIVERMORE SAMPLE #100477-WS-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.96	C_{17} alkane	<1
0.97	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.04	C_{18} alkane	<1
1.05	n-octadecane	<1
1.22	C_{21} alkane	<1
1.25	n-heneicosane	<1
1.33	$\sim C_{23}$ alkane	<1
1.37	$\sim C_{23}$ alkane	<1
1.43	n-tetracosane	<1
1.49	$\sim C_{25}$ alkane	<1
1.49	bis-(2-ethylhexyl) phthalate	∿1
1.65	unknown	

*Relative to the internal standard D-10 anthracene.

TABLE F147. LAWRENCE LIVERMORE SAMPE #100477-WS-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.03	air spike	
0.88	n-hexadecane	<1
0.96	n-heptadecane	<1
0.97	C_{18} alkane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	C_{19} alkane	<1
1.06	dibutyl phthalate isomer	<1
1.11	n-nonadecane	<1
1.13	dibutyl phthalate isomer	<1
1.18	n-eicosane	<1
1.22	unknown	
1.25	n-heneicosane	<1
1.31	n-docosane	<1
1.37	n-tricosane	<1
1.43	n-tetracosane	<1
1.49	n-pentacosane	<1
1.50	bis-(2-ethylhexyl) phthalate	<1

*Relative to the internal standard D-10 anthracene.

TABLE F148. LAWRENCE LIVERMORE SAMPLE #100477-WS-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.96	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	C_{19} alkane	<1
1.11	n-nonadecane	<1
1.13	dibutyl phthalate isomer	<1
1.18	n-eicosane	<1
1.25	n-heneicosane	<1
1.25	$\sim C_{22}$ alkane	<1
1.31	n-docosane	<1
1.43	n-tetracosane	<1
1.49	n-pentacosane	<1
1.49	bis-(2-ethylhexyl) phthalate	<1

*Relative to the internal standard D-10 anthracene.

TABLE F149. LAWRENCE LIVERMORE SAMPLE #100477-WS-3 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.32	column artifact	
0.91	$C_{14}D_{12}$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.06	phthalate (tentative)	NQ
1.13	dibutyl phthalate isomer	<1
1.19	n-eicosane	<1
1.26	n-heneicosane	<1
1.32	n-docosane	<1
1.38	n-tricosane	<1
1.51	bis-(2-ethylhexyl) phthalate	<1

*Relative to the internal standard D-10 anthracene.

TABLE F150. LAWRENCE LIVERMORE SAMPLE #100477-WS-3 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.59	$\sim C_{13}$ alkane	<1
0.62	n-tridecane	<1
0.69	$\sim C_{14}$ alkane	<1
0.71	n-tetradecane	<1
0.77	$\sim C_{15}$ alkane	<1
0.80	n-pentadecane	<1
0.88	n-hexadecane	<1
0.89	$C_{14}H_{14}O$ isomer (tentative)	NQ
0.93	$\sim C_{17}$ alkane	<1
0.96	n-heptadecane	<1
0.97	$\sim C_{18}$ alkane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	$\sim C_{19}$ alkane	<1
1.06	phthalate (tentative)	NQ
1.11	n-nonadecane	<1
1.13	dibutyl phthalate isomer	<1
1.18	n-eicosane	<1
1.24	$\sim C_{21}$ alkane	<1
1.25	n-heneicosane	<1
1.27	$\sim C_{22}$ alkane	<1
1.31	n-docosane	<1
1.34	$\sim C_{23}$ alkane	<1
1.37	n-tricosane	<1
1.39	$\sim C_{24}$ alkane	<1
1.43	n-tetracosane	<1
1.49	n-pentacosane	<1
1.50	bis-(2-ethylhexyl) phthalate	~ 2
1.53	$\sim C_{26}$ alkane	<1
1.53	n-hexacosane	<1
1.56	$\sim C_{27}$ alkane	<1
1.57	$\sim C_{27}$ alkane	<1
1.61	$\sim C_{28}$ alkane	<1
1.67	$\sim C_{29}$ alkane	<1

*Relative to the internal standard D-10 anthracene.

TABLE F151. LAWRENCE LIVERMORE SAMPLE #100477-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	air spike	
0.44	air spike	
0.88	n-hexadecane	<1
0.91	$C_{14}D_{12}$ isomer (tentative)	NQ
0.96	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	C_{19} alkane	<1
1.11	n-nonadecane	<1
1.13	di-n-butyl phthalate	<1
1.18	n-eicosane	<1
1.22	unknown	
1.25	n-heneicosane	<1
1.47	unknown mixture	
1.49	bis-(2-ethylhexyl) phthalate	<1
1.56	column artifact + unknown	
1.59	unknown mixture	
1.63	air spike	
1.64	air spike	
1.65	unknown mixture	
1.68	column artifact + unknown	
1.70	unknown mixture	
1.72	column artifact + unknown	
1.81	column artifact + unknown	
1.99	unknown mixture	

*Relative to the internal standard D-10 anthracene.

TABLE F152. LAWRENCE LIVERMORE SAMPLE #100478-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	solvent front	
0.71	n-tetradecane	<1
0.77	C_{15} alkane	<1
0.80	n-pentadecane	<1
0.88	n-hexadecane	<1
0.91	$C_{14}D_{12}$ isomer (tentative)	NQ
0.92	C_{17} alkane	<1
0.96	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	C_{19} alkane	<1
1.06	dibutyl phthalate isomer	<1
1.11	n-nonadecane	<1
1.13	dibytyl phthalate isomer	<1
1.18	n-eicosane	<1
1.22	C_{21} alkane	<1
1.25	n-heneicosane	<1
1.31	n-docosane	<1
1.49	C_{23} alkane	<1
1.50	bis-(2-ethylhexyl) phthalate	<1

*Relative to the internal standard D-10 ANTHRACENE.

TABLE F153. LAWRENCE LIVERMORE SAMPLE #100477-WS-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.96	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.11	n-nonadecane	<1
1.13	di-n-butyl phthalate	<1
1.49	$\sim C_{25}$ alkane	<1
2.02	air spike	
2.06	air spike	

*Relative to the internal standard D-10 anthracene.

TABLE F154. LAWRENCE LIVERMORE SAMPLE #100477-WS-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.45	air spike	
0.88	n-hexadecane	<1
0.96	n-heptadecane	<1
0.97	$\sim C_{18}$ alkane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	$\sim C_{19}$ alkane	<1
1.06	phthalate (tentative)	NQ
1.10	unknown	
1.11	n-nonadecane	<1
1.13	di-n-butyl phthalate	<1
1.17	unknown	
1.18	n-eicosane	<1
1.22	$\sim C_{21}$ alkane	<1
1.24	unknown	
1.25	n-heneicosane	<1
1.31	n-docosane	<1
1.35	phthalate (tentative)	NQ
1.37	n-tricosane	<1
1.42	unknown	
1.43	n-tetracosane	<1
1.49	n-pentacosane	<1
1.49	bis-(2-ethylhexyl) phthalate	<1
1.56	n-hexacosane	<1
1.71	air spike	
1.89	air spike	
2.00	air spike	

*Relative to the internal standard D-10 anthracene.

TABLE F155. LAWRENCE LIVERMORE SAMPLE #100477-WS-9 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.62	unknown	
0.65	unknown	
0.79	air spike	
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.11	n-nonadecane	<1

*Relative to the internal standard D-10 anthracene.

TABLE F156. LAWRENCE LIVERMORE SAMPLE #100477-WS-9 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.19	$C_6H_{10}O$ isomer (tentative)	NQ
0.19	unknown	
0.38	dimethylaniline isomer	<1
0.40	unknown	
0.41	unknown	
0.96	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.11	n-nonadecane	<1
1.13	dibutyl phthalate isomer	<1
1.18	n-eicosane	<1
1.31	n-docosane	<1
1.37	n-tricosane	<1
1.43	n-tetracosane	<1
1.49	bis-(2-ethylhexyl) phthalate	<1

*Relative to the internal standard D-10 anthracene.

TABLE F157. LAWRENCE LIVERMORE SAMPLE #100477-B A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.33	unknown	
0.39	$C_8H_{11}N$ isomer (tentative)	NQ
0.55	unknown	
0.59	unknown	
0.62	unknown	
0.96	n-heptadecane	<1
0.97	C_{18} alkane	<1
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	<1
1.05	C_{19} alkane	<1
1.11	n-nonadecane	<1
1.13	dibutyl phthalate isomer	<1
1.18	n-eicosane	<1
1.25	n-heneicosane	<1
1.31	n-docosane	<1
1.37	n-tricosane	<1
1.43	n-tetracosane	<1
1.49	n-pentacosane	<1
1.49	bis-(2-ethylhexyl) phthalate	<1
1.56	n-hexacosane	<1
1.82	air spike	
1.98	air spike	

*Relative to the internal standard D-10 anthracene.

TABLE F158. LAWRENCE LIVERMORE SAMPLE #100477-B B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.88	n-hexadecane	<1
0.92	C_{17} alkane	<1
0.96	C_{17} alkane	<1
0.96	n-heptadecane	<1
0.97	C_{18} alkane	<1
0.99	$C_{14}D_{10}$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.03	C_{18} alkane	<1
1.04	n-octadecane	<1
1.04	C_{19} alkane	<1
1.05	C_{19} alkane	<1
1.11	n-nonadecane	<1
1.14	C_{20} alkane	<1
1.17	C_{20} alkane	<1
1.18	n-eicosane	<1
1.21	C_{21} alkane	<1
1.24	C_{21} alkane	<1
1.25	n-heneicosane	<1
1.27	C_{22} alkane	<1
1.30	C_{22} alkane	<1
1.31	n-docosane	<1
1.34	C_{23} alkane	<1
1.37	n-tricosane	<1
1.40	C_{24} alkane	<1
1.43	n-tetracosane	<1
1.46	C_{25} alkane	<1
1.49	bis-(2-ethylhexyl) phthalate + n-pentacosane	<1
1.52	C_{26} alkane	<1
1.53	C_{26} alkane	<1
1.56	n-hexacosane	<1
1.59	C_{27} alkane	<1
1.61	C_{27} alkane	<1
1.64	n-heptacosane	<1
1.68	C_{28} alkane	<1
1.74	n-octacosane	<1
1.87	n-nonacosane	<1

*Relative to the internal standard D-10 anthracene.

TABLE F159. LAWRENCE LIVERMORE SAMPLE #120277-WS-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.30	phenol	>20000
0.36	o-cresol	>20000
0.39	p-cresol	>20000
0.46	dimethylphenol isomer	∿8200
0.47	C_2 alkylphenol isomer	>20000
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F160. LAWRENCE LIVERMORE SAMPLE #120277-WS-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	C_3 alkylbenzene isomer	∿14000
0.36	C_3 alkylbenzene isomer	∿12000
0.38	trimethylbenzene isomer	∿14000
0.40	n-decane	>20000
0.40	trimethylbenzene isomer	∿16000
0.41	C_9H_{10} isomer (tentative)	NQ
0.49	n-undecane	>20000
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	C_4 alkylbenzene isomer	∿14000
0.55	naphthalene	>20000
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	n-dodecane	>20000
0.60	C_{13} alkane	∿13000
0.64	$C_{11}H_{14}$ isomer (tentative)	NQ
0.64	methylnaphthalene isomer	>20000
0.66	methylnaphthalene isomer	>20000
0.67	n-tridecane	>20000
0.68	$C_{12}H_{16}$ isomer (tentative)	NQ
0.70	$C_{13}H_{18}$ isomer (tentative)	NQ
0.73	C_{14} alkane	∿16000
0.75	n-tetradecane	>20000
0.80	C_{15} alkane	∿15000
0.83	n-pentadecane	>20000
0.85	trimethylnaphthalene isomer	∿8500
0.87	diethyl phthalate	4000
0.90	n-hexadecane	>20000
0.93	C_{17} alkane	∿9000
0.96	n-heptadecane	>20000
0.97	C_{18} alkane	∿9200
0.99	C_{18} alkane	∿10000
1.00	D-10 ANTHRACENE	IS
1.02	n-octadecane	1100
1.09	n-nonadecane	9500
1.14	n-eicosnae	7400
1.19	n-heneicosane	8200
1.25	n-docosane	7600
1.30	n-tricosane	8300
1.35	n-tetracosane	8400
1.40	n-pentacosane	8500
1.46	n-hexacosane	4400
1.53	n-heptacosane	∿4700

*Relative to the internal standard D-10 anthracene.

TABLE F161. LAWRENCE LIVERMORE SAMPLE #120277-WS-4 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	2200
0.36	o-cresol	1400
0.38	p-cresol	4500
0.40	dimethylphenol isomer	∼820
0.44	ethylphenol isomer	∼3100
0.45	dimethylphenol isomer	∼3200
0.48	C_2 alkylphenol isomer	∼860
0.48	C_3 alkylphenol isomer	∼1300
0.50	C_3 alkylphenol isomer	∼400
0.50	C_3 alkylphenol isomer	∼260
0.52	n-propylphenol	∼170
0.52	trimethylphenol isomer	∼180
0.53	C_3 alkylphenol isomer	∼460
0.53	C_3 alkylphenol isomer	∼510
0.54	C_3 alkylphenol isomer	∼580
0.54	ethylmethylphenol isomer	∼370
0.56	$C_9H_{12}O$ isomer (tentative)	NQ
0.57	trimethylphenol isomer	∼210
0.58	C_3 alkylphenol isomer	∼70
0.60	diethylphenol isomer	∼76
0.61	unknown	
0.62	C_4 alkylphenol isomer	∼320
0.64	unknown	
0.65	unknown	
0.68	C_5 alkylbenzene isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F162. LAWRENCE LIVERMORE SAMPLE #1202277-WS-4 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	n-octane	1300
0.19	xylene isomer	~7700
0.20	xylene isomer	~4300
0.21	nonene	~680
0.22	n-nonane	1700
0.23	impure C_3 alkylbenzene isomer	~600
0.26	unknown	
0.27	C_3 alkylbenzene isomer	~3400
0.27	trimethylbenzene isomer	~1800
0.28	C_3 alkylbenzene isomer	~2700
0.29	unknown	
0.30	C_3 alkylbenzene isomer	~590
0.31	decene	~570
0.32	n-decane	2100
0.33	C_4 alkylbenzene isomer	~540
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.34	C_{11} alkane	~450
0.35	unknown	
0.35	C_4 alkylbenzene isomer	~590
0.36	C_4 alkylbenzene isomer	~1000
0.36	C_4 alkylbenzene isomer	~840
0.37	unknown	
0.38	C_4 alkylbenzene isomer	~1000
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.39	impure C_4 alkylbenzene isomer	~490
0.40	methylbenzofuran (tentative)	NQ
0.41	undecene + C_4 alkylbenzene isomer	~2300
0.41	unknown	
0.42	n-undecane	2700
0.43	unknown	
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	$C_{11}H_{16}$ isomer (tentative)	NQ
0.49	unknown	
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	unknown	
0.50	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	C_2 alkylbenzofuran isomer (tentative)	NQ
0.51	dodecene	~730
0.51	C_2 alkylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane	2200
0.53	$C_{11}H_{14}$ isomer (tentative)	NQ
0.54	C_{13} alkane	~1100
0.54	$C_{12}H_{16}$ isomer (tentative)	NQ
0.55	unknown	

(continued)

TABLE F162. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.55	unknown	
0.56	$C_{11}H_{12}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	unknown	
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	methylnaphthalene isomer + C_{13} alkane	∿820
0.59	C_{13} alkane	∿590
0.60	methylnaphthalene isomer	∿390
0.61	tridecene	∿870
0.61	unknown	
0.62	n-tridecane	2100
0.62	$C_{12}H_{16}$ isomer (tentative)	NQ
0.64	mixture (tentative)	NQ
0.65	unknown	
0.65	$C_{13}H_{18}$ isomer (tentative)	NQ
0.66	biphenyl	2000
0.67	unknown	
0.68	impure C_2 alkylnaphthalene isomer	∿1100
0.69	unknown	
0.69	C_{14} alkane + dimethylnaphthalene isomer	∿1700
0.71	dimethylnaphthalene isomer	∿1300
0.71	n-tetradecane	1500
0.72	mixture	
0.72	unknown	
0.73	C_2 alkylnaphthalene isomer	∿650
0.75	unknown	
0.76	acenaphthene	∿2400
0.76	unknown	
0.77	C_{15} alkane	∿780
0.79	unknown	
0.79	pentadecene	∿540
0.80	unknown	
0.80	n-pentadecane	1500
0.82	unknown	
0.83	C_3 alkylnaphthalene isomer	∿1100
0.84	fluorene	1000
0.85	C_3 alkylnaphthalene isomer	∿1100
0.87	hexadecene	∿910
0.89	n-hexadecane	2500
0.90	unknown	
0.93	C_{17} alkane	∿710
0.94	unknown	
0.95	mixture	
0.96	heptadecene	∿790
0.97	n-heptadecane	1900

(continued)

TABLE F162. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.97	C_{18} alkane	$\sim$400
0.99	$\sim C_{19}$ alkene	$\sim$330
1.00	$C_{14}H_{10}$ isomer	$\sim$450
1.00	D-10 ANTHRACENE	IS
1.00	octadecene	$\sim$240
1.04	n-octadecane	730
1.12	n-nonadecane	610
1.18	unknown	
1.19	n-eicosane	570
1.26	n-heneicosane	470
1.32	n-docosane	460
1.38	n-tricosane	430
1.44	n-tetracosane	390
1.50	n-pentacosane	470
1.56	n-hexacosane	250
1.64	n-heptacosane	$\sim$260

*Relative to the internal standard D-10 anthracene.

TABLE F163. LAWRENCE LIVERMORE SAMPLE #120277-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.39	phenol	∿820
0.40	n-decane	240
0.45	o-cresol	670
0.48	p-cresol	140
0.49	dimethylphenol isomer	∿260
0.49	n-undecane	21
0.53	ethylphenol isomer	∿140
0.54	dimethylphenol isomer	∿140
0.55	naphthalene	∿68
0.56	dimethylphenol isomer	∿240
0.57	C_{12} alkene	∿39
0.59	n-dodecane	70
0.60	C_{13} alkane	∿10
0.64	C_3 alkylphenol isomer	∿88
0.64	methylnaphthalene isomer	∿89
0.66	methylnaphthalene isomer	∿9
0.67	n-tridecane	47
0.75	n-tetradecane	58
0.80	C_{15} alkane	∿17
0.83	n-pentadecane	92
0.85	C_3 alkylnaphthalene isomer	∿14
0.87	C_3 alkylnaphthalene isomer + diethyl phthalate (tentative)	∿24
0.90	n-hexadecane	53
0.96	n-heptadecane	43
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	19
1.09	n-nonadecane	17
1.15	n-eicosane	13
1.20	n-heneicosane	13
1.25	n-docosane	32
1.30	n-tricosane	26
1.35	n-tetracosane	34
1.40	n-pentacosane	34
1.46	n-hexacosane	16
1.53	n-heptacosane	∿14

*Relative to the internal standard D-10 anthracene.

TABLE F164. LAWRENCE LIVERMORE SAMPLE #120277-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	780
0.19	xylene isomer	∿400
0.20	xylene isomer	∿680
0.22	n-nonane	660
0.23	C_3 alkylbenzene isomer	∿230
0.26	C_8H_8O isomer (tentative)	NQ
0.26	unknown	
0.27	C_3 alkylbenzene isomer	∿950
0.27	trimethylbenzene isomer	∿500
0.28	C_3 alkylbenzene isomer	∿1100
0.29	benzofuran (tentative)	NQ
0.30	C_3 alkylbenzene isomer	∿870
0.31	∿C_{10} alkene	∿200
0.32	n-decane	670
0.33	trimethylbenzene isomer	∿630
0.33	C_4 alkylbenzene isomer	∿290
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.36	C_4 alkylbenzene isomer	∿180
0.36	butylbenzene isomer	∿520
0.36	C_4 alkylbenzene isomer	∿340
0.37	C_4 alkylbenzene isomer	∿280
0.39	$C_{10}H_{12}$ isomer (tentative)	NQ
0.39	C_4 alkylbenzene isomer	∿350
0.40	C_4 alkylbenzene isomer	∿100
0.40	methylbenzofuran isomer (tentative)	NQ
0.41	methylbenzofuran isomer (tentative)	NQ
0.41	∿C_{11} alkene	∿360
0.42	n-undecane	1600
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	∿1100
0.48	unknown	
0.49	dimethylindan isomer (tentative)	NQ
0.50	dimethylindan isomer (tentative)	NQ
0.51	C_{12} alkene	∿290
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane	1400
0.53	unknown	
0.54	∿C_{13} alkane	∿380
0.55	dimethylindan isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	dimethylindan isomer (tentative)	NQ
0.59	methylnaphthalene isomer	∿1900

(continued)

TABLE F164. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.59	unknown	
0.60	methylnaphthalene isomer	∼1600
0.61	C_{13} alkene	∼430
0.62	n-tridecane	1200
0.63	$C_{12}H_{16}$ isomer (tentative)	NQ
0.66	biphenyl	720
0.67	unknown	
0.68	ethylnaphthalene isomer	∼380
0.69	dimethylnaphthalene isomer + C_{14} alkane	∼830
0.71	dimethylnaphthalene isomer	∼830
0.71	n-tetradecane	720
0.74	ethylnaphthalene isomer	∼290
0.75	unknown	
0.76	acenaphthene	∼1200
0.76	unknown	
0.77	∼C_{15} alkane	∼320
0.79	dibenzofuran	310
0.80	∼C_{15} alkene	∼370
0.80	unknown	
0.81	n-pentadecane	980
0.83	C_3 alkylnaphthalene isomer	∼510
0.84	fluorene	560
0.85	C_3 alkylnaphthalene isomer	∼510
0.89	n-hexadecane	1100
0.93	∼C_{18} alkane	∼200
0.97	n-heptadecane	950
0.98	∼C_{18} alkane	∼180
1.00	D-10 ANTHRACENE	IS
1.00	∼C_{18} alkene	∼570
1.04	n-octadecane	340
1.12	n-nonadecane	300
1.18	unknown	
1.19	n-eicosane	300
1.26	n-heneicosane	240
1.32	n-docosane	210
1.39	n-tricosane	200
1.45	n-tetracosane	150
1.51	n-pentacosane	140

*Relative to the internal standard D-10 anthracene.

TABLE F165. LAWRENCE LIVERMORE SAMPLE #010678-WS-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.28	C_3 alkylbenzene isomer	~7
0.30	phenol	~3800
0.32	trimethylbenzene isomer	~21
0.33	C_9H_{10} isomer	~56
0.34	C_9H_8 isomer (tentative)	NQ
0.36	o-cresol	350
0.39	cresol isomer	~3700
0.41	impure methylbenzofuran (tentative)	NQ
0.44	ethylphenol isomer	~530
0.45	$C_{10}H_{12}$ isomer	~450
0.45	dimethylphenol isomer	~890
0.48	naphthalene + C_2 alkylphenol isomer	~940
0.50	dimethylphenol isomer	~220
0.50	mixture (tentative)	NQ
0.53	C_3 alkylphenol isomer	~140
0.53	C_3 alkylphenol isomer	~230
0.54	C_3 alkylphenol isomer	~330
0.54	C_3 alkylphenol isomer	~160
0.56	$C_9H_{12}O$ isomer (tentative)	NQ
0.57	C_3 alkylphenol isomer	~120
0.58	methylnaphthalene isomer	~64
0.60	methylnaphthalene isomer	~46
0.63	C_2 alkylbenzaldehyde (tentative)	NQ
0.64	mixture (tentative)	NQ
0.68	C_5 alkylbenzene isomer	~23
1.00	D-10 ANTHRACENE	IS
1.65	impure bis-(2-ethylhexyl)phthalate	~33

*Relative to the internal standard D-10 anthracene.

TABLE F166. LAWRENCE LIVERMORE SAMPLE #010678-WS-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.17	methylpyridine isomer	~110
0.17	methylpyridine isomer	~68
0.18	ethylbenzene	66
0.18	xylene isomer	~110
0.20	xylene isomer	~76
0.27	C_3 alkylbenzene isomer	~3
0.27	C_3 alkylbenzene isomer	~42
0.28	C_3 alkylbenzene isomer	~49
0.29	benzofuran (tentative)	NQ
0.30	trimethylbenzene isomer	~130
0.32	trimethylbenzene isomer	~120
0.33	C_9H_{10} isomer	~380
0.34	C_9H_8 isomer (tentative)	NQ
0.36	mixture (tentative)	NQ
0.37	C_4 alkylbenzene isomer	~13
0.38	C_4 alkylbenzene isomer	~25
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.39	methylbenzofuran (tentative)	NQ
0.40	methylbenzofuran (tentative)	NQ
0.41	methylbenzofuran (tentative)	NQ
0.42	C_4 alkylbenzene isomer	~57
0.44	$X_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	C_4 alkylbenzene isomer	~450
0.49	impure naphthalene	~200
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	impure $C_{11}H_{14}$ isomer (tentative)	NQ
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane +	~45
	$C_{11}H_{14}$ isomer (tentative)	NQ
0.53	$C_{11}H_{14}$ isomer (tentative)	NQ
0.54	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ
0.59	methylnaphthalene isomer	~300
0.60	methylnaphthalene isomer	~220
0.61	n-tridecane +	~7
	$C_{12}H_{16}$ isomer (tentative)	NQ
0.66	biphenyl	43
0.69	dimethylnaphthalene isomer	~36
0.70	dimethylnaphthalene isomer	~37
0.71	dimethylnaphthalene isomer	~83

(continued)

TABLE F166. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.72	dimethylnaphthalene isomer	~3
0.73	ethylnaphthalene isomer	~15
0.75	acenaphthene	~24
0.78	dibenzofuran	58
0.83	C_3 alkylnaphthalene isomer	~22
0.84	fluorene	66
0.85	C_3 alkylnaphthalene isomer	~21
0.99	$C_{14}H_{10}$ isomer	~33
1.00	D-10 ANTHRACENE	IS
1.65	impure bis-(2-ethylhexyl)phthalate	~75

*Relative to the internal standard D-10 anthracene.

TABLE F167. LAWRENCE LIVERMORE SAMPLE #010478-WS-3 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	xylene isomer	~5
0.30	phenol	270
0.36	cresol isomer	>20000
0.39	cresol isomer	~10000
0.42	dimethylphenol isomer	~43
0.44	ethylphenol isomer	~560
0.45	dimethylphenol isomer	~890
0.49	dimethylphenol isomer	~630
0.50	dimethylphenol isomer	~48
0.51	dimethylphenol isomer	~390
0.53	C_3 alkylphenol isomer	~62
0.54	C_3 alkylphenol isomer	~150
0.54	C_3 alkylphenol isomer	~85
0.55	C_3 alkylphenol isomer	~28
0.57	C_3 alkylphenol isomer	~490
0.58	C_3 alkylphenol isomer	~80
0.58	C_3 alkylphenol isomer	~68
0.61	ethylbenzaldehyde isomer (tentative)	NQ
0.64	C_2 alkylbenzaldehyde isomer (tentative)	NQ
0.64	unknown	
0.68	C_5 alkylbenzene isomer (tentative)	NQ
0.70	C_5 alkylbenzene isomer (tentative)	NQ
0.71	n-tetradecane	14
0.73	C_5 alkylbenzene isomer (tentative)	NQ
0.74	acenaphthene	~11
0.83	C_3 alkylnaphthalene isomer	~8
0.84	fluorene	25
0.85	C_3 alkylnaphthalene isomer	~6
0.88	n-pentadecane	10
0.89	C_5 alkylnaphthalene isomer (tentative)	NQ
0.96	n-heptadecane	8
0.99	$C_{14}H_{10}$ isomer	~60
1.00	D-10 ANTHRACENE	IS
1.04	impure n-octadecane	4
1.08	unknown	
1.09	unknown	
1.13	unknown	
1.27	$C_{15}H_{16}O_2$ isomer (tentative)	NQ
1.44	phthalate, $C_{24}H_{38}O_4$	~9
1.49	phthalate, $C_{24}H_{38}O_4$	~21

*Relative to the internal standard D-10 anthracene.

TABLE F168. LAWRENCE LIVERMORE SAMPLE #010678-WS-3 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.19	xylene isomer	∿15
0.20	xylene isomer	∿14
0.29	phenol	220
0.34	unknown	
0.36	o-cresol	210
0.38	cresol isomer	∿370
0.44	ethylphenol isomer	∿21
0.45	dimethylphenol isomer	∿150
0.47	naphthalene	∿410
0.51	$\sim C_{12}$ alkene	∿46
0.56	C_3 alkylphenol isomer	∿66
0.58	methylnaphthalene isomer	∿37
0.60	methylnaphthalene isomer	∿24
0.75	acenaphthene	∿48
0.78	dibenzofuran	32
0.84	fluorene	71
0.88	n-hexadecane	16
0.89	unknown	
0.91	unknown	
0.96	n-heptadecane	14
0.99	$C_{14}H_{10}$ isomer	∿12
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	5
1.07	unknown	
1.08	unknown	
1.09	unknown	
1.13	unknown	
1.14	unknown	

*Relative to the internal standard D-10 anthracene.

TABLE F169. LAWRENCE LIVERMORE SAMPLE #010478-WS-4 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	n-octane	49
0.18	ethylbenzene	110
0.19	xylene isomer	∿310
0.20	xylene isomer	∿170
0.21	nonene	∿68
0.22	n-nonane	250
0.23	∿C_9 alkene	∿83
0.23	impure C_3 alkylbenzene isomer	∿54
0.27	C_3 alkylbenzene isomer	∿220
0.27	trimethylbenzene isomer	∿73
0.28	C_3 alkylbenzene isomer	∿180
0.30	C_3 alkylbenzene isomer	∿220
0.31	decene	∿64
0.32	n-decane	260
0.33	C_3 alkylbenzene isomer	∿240
0.33	C_4 alkylbenzene isomer	∿56
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_{11} alkane	∿98
0.35	C_4 alkylbenzene isomer	∿22
0.36	C_4 alkylbenzene isomer	∿130
0.36	C_4 alkylbenzene isomer	∿83
0.37	C_4 alkylbenzene isomer	∿50
0.38	impure C_4 alkylbenzene isomer	∿73
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.39	C_4 alkylbenzene isomer	∿100
0.41	impure undecene	∿270
0.42	n-undecane	370
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	∿220
0.46	$C_{11}H_{16}$ isomer (tentative)	NQ
0.48	naphthalene	∿830
0.48	C_{12} alkane +	∿99
	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	$C_{11}H_{14}$ isomer (tentative)	NQ
0.51	dodecene	∿140
0.51	unknown	
0.52	n-dodecane	410
0.53	∿C_{13} alkene	∿43
0.53	C_{13} alkane	∿150
0.55	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	unknown	
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ

(continued)

TABLE F169. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.58	C_{13} alkane	∿48
0.59	methylnaphthalene isomer	∿390
0.59	C_{13} alkane	∿82
0.60	methylnaphthalene isomer	∿280
0.60	∿C_{13} alkene +	∿130
	$C_{12}H_{16}$ isomer (tentative)	NQ
0.62	n-tridecane	330
0.65	$C_{13}H_{18}$ isomer (tentative)	NQ
0.66	biphenyl	110
0.66	unknown	
0.69	C_{14} alkane + C_2 alkylnaphthalene isomer	∿210
0.70	∿C_{14} alkene	∿30
0.70	ethylnaphthalene isomer	∿140
0.71	n-tetradecane	150
0.73	ethylnaphthalene isomer	∿120
0.74	unknown	
0.74	unknown	
0.75	acenaphthene + unknown	∿300
0.77	unknown	
0.77	C_{15} alkane	∿210
0.77	unknown	
0.79	∿C_{15} alkene	∿86
0.80	unknown	
0.80	n-pentadecane	350
0.83	C_3 alkylnaphthalene isomer	∿160
0.84	fluorene	98
0.85	C_3 alkylnaphthalene isomer	∿120
0.88	n-hexadecane	230
0.89	C_5 alkylnaphthalene isomer (tentative)	NQ
0.92	C_{17} alkane	∿92
0.93	unknown	
0.95	unknown	
0.96	n-heptadecane	170
0.96	unknown	
0.97	C_{18} alkane	∿14
0.98	∿C_{19} alkene	∿49
0.99	$C_{14}H_{10}$ isomer	∿180
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	100
1.07	unknown	
1.08	unknown	
1.08	unknown	
1.10	unknown	
1.11	n-nonadecane	66

(continued)

TABLE F169. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.12	unknown	
1.13	unknown	
1.14	unknown	
1.14	unknown	
1.15	unknown	
1.17	unknown	
1.18	n-eicosane	72
1.19	unknown	
1.19	unknown	
1.21	unknown	
1.22	unknown	
1.24	unknown	
1.24	n-heneicosane	82
1.26	unknown	
1.27	unknown	
1.28	unknown	
1.31	n-docosane	59
1.37	n-tricosane	72
1.43	n-tetracosane	63
1.49	bis-(2-ethylhexyl) phthalate	∿620
1.55	n-hexacosane	5
1.63	n-heptacosane	∿49
1.85	phthalate (tentative)	NQ

*Relative to the internal standard D-10 anthracene.

TABLE F170. LAWRENCE LIVERMORE SAMPLE #010478-WS-4 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	1300
0.19	xylene isomer	∿2500
0.20	impure C_6H_8S isomer (tentative)	NQ
0.20	xylene isomer	∿2400
0.21	nonene	∿67
0.22	n-nonane	670
0.23	impure C_3 alkylbenzene isomer	∿140
0.24	unknown	
0.25	C_{10} alkane	∿78
0.26	C_9H_{12} isomer (tentative)	NQ
0.27	C_3 alkylbenzene isomer	∿290
0.28	trimethylbenzene isomer	∿300
0.29	C_3 alkylbenzene isomer	∿220
0.29	benzofuran (tentative)	NQ
0.30	impure C_3 alkylbenzene isomer	∿170
0.31	decene	∿110
0.32	n-decane	440
0.33	C_4 alkylbenzene isomer	∿320
0.33	impure C_4 alkylbenzene isomer	∿270
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	impure C_9H_8 isomer (tentative)	NQ
0.35	C_4 alkylbenzene isomer	∿75
0.35	C_4 alkylbenzene isomer	∿170
0.36	C_4 alkylbenzene isomer	∿390
0.36	C_4 alkylbenzene isomer	∿220
0.37	C_4 alkylbenzene isomer	∿180
0.38	C_4 alkylbenzene isomer	∿480
0.38	C_4 alkylbenzene isomer +	∿340
	$C_{10}H_{12}$ isomer (tentative)	NQ
0.39	impure C_4 alkylbenzene isomer	∿170
0.39	methylbenzofuran isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.41	C_4 alkylbenzene isomer	∿110
0.42	n-undecane	810
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	C_4 alkylbenzene isomer	∿200
0.46	$C_{11}H_{16}$ isomer (tentative)	NQ
0.48	unknown	
0.48	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	C_2 alkylbenzofuran isomer (tentative)	NQ
0.51	dodecene +	∿220
	C_2 alkylbenzofuran isomer (tentative)	NQ

(continued)

TABLE F170. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.51	C_2 alkylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane	690
0.53	unknown	
0.54	C_{13} alkane	~320
0.54	unknown	
0.55	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{12}$ isomer (tentative)	NQ
0.57	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ
0.59	methylnaphthalene isomer	~680
0.60	C_{13} alkane	~110
0.61	methylnaphthalene isomer	~230
0.61	impure tridecene	~150
0.62	n-tridecane	480
0.62	$C_{12}H_{16}$ isomer (tentative)	NQ
0.65	unknown	
0.65	$C_{13}H_{18}$ isomer (tentative)	NQ
0.66	biphenyl	280
0.66	unknown	
0.68	unknown	
0.69	dimethylnaphthalene isomer + ~C_{14} alkane	~320
0.71	dimethylnaphthalene isomer	~280
0.72	n-tetradecane	280
0.73	ethylnaphthalene isomer	~140
0.75	unknown	
0.76	acenaphthene	~390
0.77	~C_{15} alkane	~280
0.78	C_3 alkylnaphthalene isomer	~32
0.79	impure dibenzofuran	~120
0.79	~C_{15} alkane	~140
0.80	unknown	
0.80	n-pentadecane	430
0.82	C_3 alkylnaphthalene isomer	~41
0.83	C_3 alkylnaphthalene isomer	~210
0.84	fluorene	170
0.85	C_3 alkylnaphthalene isomer	~170
0.87	unknown	
0.88	n-hexadecane	420
0.88	$C_{15}H_{18}$ isomer (tentative)	NQ
0.91	unknown	
0.92	unknown	
0.93	~C_{17} alkane	~130
0.96	unknown	
0.97	n-heptadecane	320
0.97	~C_{18} alkane	~36

(continued)

TABLE F170. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.99	$\sim C_{18}$ alkene	~66
1.00	$C_{14}H_{10}$ isomer	~66
1.00	D-10 ANTHRACENE	IS
1.01	nonadecene	~130
1.04	unknown	
1.07	n-octadecane	44
1.08	unknown	
1.09	unknown	
1.10	unknown	
1.11	unknown	
1.12	n-nonadecane	94
1.13	unknown	
1.18	unknown	
1.19	n-eicosane	83
1.23	unknown	
1.26	n-heneicosane	83
1.27	unknown	
1.29	unknown	
1.32	n-docosane	53
1.38	n-tricosane	56
1.44	n-tetracosane	45
1.50	n-pentacosane	57
1.50	bis-(2-ethylhexyl)phthalate	~410
1.64	unknown	
1.80	phthalate (tentative)	NQ

*Relative to the internal standard D-10 anthracene.

TABLE F171. LAWRENCE LIVERMORE SAMPLE #010478-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	200
0.18	xylene isomer	∿2100
0.20	xylene isomer	∿1600
0.26	C_3 alkylbenzene isomer	∿190
0.27	C_3 alkylbenzene isomer	∿170
0.27	trimethylbenzene isomer	∿74
0.28	C_3 alkylbenzene isomer	∿69
0.30	trimethylbenzene isomer	∿260
0.32	n-decane	98
0.32	trimethylbenzene isomer	∿250
0.33	C_4 alkylbenzene isomer	∿45
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.38	C_4 alkylbenzene isomer	∿67
0.40	methylbenzofuran isomer (tentative)	NQ
0.42	n-undecane	140
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	∿53
0.47	naphthalene	∿2300
0.48	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.51	C_{12} alkene	∿30
0.52	n-dodecane	200
0.57	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	methylnaphthalene isomer	∿340
0.60	methylnaphthalene isomer	∿230
0.60	C_{13} alkene	∿57
0.61	n-tridecane	150
0.66	biphenyl	47
0.69	dimethylnaphthalene isomer + C_{14} alkane	∿2
0.70	dimethylnaphthalene isomer	∿100
0.70	dimethylnaphthalene isomer	∿94
0.71	n-tetradecane	120
0.75	acenaphthene	∿140
0.77	C_{15} alkane	∿30
0.79	unknown	
0.80	n-pentadecane	150
0.83	C_3 alkylnaphthalene isomer	∿75
0.85	C_3 alkylnaphthalene isomer	∿77
0.88	n-hexadecane	160
0.89	unknown	
0.97	n-heptadecane	47
1.00	D-10 ANTHRACENE	IS

(continued)

TABLE F171. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.04	n-octadecane	53
1.08	unknown	
1.09	unknown	
1.12	n-nonadecane	50
1.13	unknown	
1.19	n-eicosane	35
1.23	unknown	
1.26	n-heneicosane	57
1.32	n-docosane	42
1.38	n-tricosane	42
1.44	n-tetracosane	29
1.50	n-pentacosane	33
1.51	bis-(2-ethylhexyl)phthalate	∿240

*Relative to the internal standard D-10 anthracene.

TABLE F172. LAWRENCE LIVERMORE SAMPLE #010478-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.02	C_3 alkylbenzene isomer	~43
0.08	C_3 alkylbenzene isomer	~770
0.09	trimethylbenzene isomer	~210
0.10	C_3 alkylbenzene isomer	~360
0.12	benzofuran (tentative)	NQ
0.12	trimethylbenzene isomer	~510
0.16	trimethylbenzene isomer	~630
0.17	C_9H_{10} isomer (tentative)	NQ
0.18	C_9H_8 isomer (tentative)	NQ
0.21	C_4 alkylbenzene isomer	~28
0.22	unknown	
0.24	C_4 alkylbenzene isomer	~33
0.24	$C_{10}H_{12}$ isomer (tentative)	NQ
0.26	C_{11} alkane +	~89
	methylbenzofuran isomer (tentative)	NQ
0.26	methylbenzofuran isomer (tentative)	NQ
0.27	methylbenzofuran isomer (tentative)	NQ
0.29	n-undecane	160
0.32	$C_{10}H_{12}$ isomer (tentative)	NQ
0.33	$C_{10}H_{12}$ isomer (tentative)	NQ
0.34	C_4 alkylbenzene isomer	~270
0.37	naphthalene	~1800
0.38	impure $C_{11}H_{14}$ isomer (tentative)	NQ
0.41	dimethylbenzofuran isomer (tentative)	NQ
0.41	dimethylbenzofuran isomer (tentative)	NQ
0.42	n-dodecane	130
0.44	impure C_{13} alkane	~53
0.47	$C_{11}H_{14}$ isomer (tentative)	NQ
0.51	methylnaphthalene isomer	~400
0.52	methylnaphthalene isomer	~240
0.54	n-tridecane	91
0.55	$C_{12}H_{16}$ isomer (tentative)	NQ
0.60	biphenyl	87
0.63	dimethylnaphthalene isomer	~82
0.64	dimethylnaphthalene isomer	~7
0.65	dimethylnaphthalene isomer	~62
0.65	n-tetradecane	110
0.67	dimethylnaphthalene isomer	~60
0.68	C_2 alkylnaphthalene isomer	~29
0.71	acenaphthene	~57
0.72	C_{15} alkane	~30
0.76	n-pentadecane	140
0.80	trimethylnaphthalene isomer	~35
0.81	fluorene	40
0.82	diethyl phthalate	480

(continued)

TABLE F172. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.86	n-hexadecane	70
0.95	n-heptadecane	51
0.96	C_{18} alkane	~19
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	24
1.12	n-nonadecane	31
1.20	n-eicosane	35
1.28	n-heneicosane	17
1.35	n-docosane	17
1.42	n-tricosane	18
1.49	n-tetracosane	12

*Relative to the internal standard D-10 anthracene.

TABLE F173. LAWRENCE LIVERMORE SAMPLE #010478-WS-6 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	n-octane	300
0.18	ethylbenzene	250
0.18	impure xylene isomer	~290
0.20	xylene isomer	~330
0.22	n-nonane	170
0.23	C_3 alkylbenzene isomer	~58
0.26	unknown	
0.27	C_3 alkylbenzene isomer	~290
0.27	C_3 alkylbenzene isomer	~240
0.27	trimethylbenzene isomer	~160
0.28	C_3 alkylbenzene isomer	~240
0.30	trimethylbenzene isomer	~290
0.30	decene	~49
0.32	n-decane	210
0,32	C_3 alkylbenzene isomer	~320
0.33	C_4 alkylbenzene isomer	~140
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.36	C_4 alkylbenzene isomer	~150
0.36	C_4 alkylbenzene isomer	~88
0.37	C_4 alkylbenzene isomer	~78
0.38	C_4 alkylbenzene isomer	~130
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.38	C_4 alkylbenzene isomer	~100
0.40	methylbenzofuran isomer (tentative)	NQ
0.40	impure undecene	~190
0.42	n-undecane	430
0.43	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	~220
0.46	unknown	
0.47	unknown	
0.48	naphthalene	~240
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	dodecene	~66
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane	370
0.53	unknown	
0.57	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	methylnaphthalene isomer	~530
0.60	methylnaphthalene isomer	~310
0.61	n-tridecane	290
0.62	$C_{12}H_{16}$ isomer (tentative)	NQ
0.66	biphenyl	65
0.69	dimethylnaphthalene isomer + C_{14} alkane	~110

(continued)

TABLE F173. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.70	dimethylnaphthalene isomer	~150
0.70	dimethylnaphthalene isomer	~200
0.71	n-tetradecane	200
0.73	ethylnaphthalene isomer	~60
0.75	acenaphthene	~180
0.79	unknown	
0.80	unknown	
0.80	n-pentadecane	190
0.83	C_3 alkylnaphthalene isomer	~77
0.84	fluorene	83
0.85	trimethylnaphthalene iosmer	~98
0.88	n-hexadecane	180
0.97	n-heptadecane	160
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	54
1.12	n-nonadecane	50
1.19	n-eicosane	47
1.26	n-heneicosane	53
1.32	n-docosane	39
1.38	n-tricosane	35
1.44	n-tetracosane	29

*Relative to the internal standard D-10 anthracene.

TABLE F174. LAWRENCE LIVERMORE SAMPLE #010478-WS-6 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	3100
0.18	xylene isomer	∿3600
0.20	xylene isomer	∿3700
0.27	C_3 alkylbenzene isomer	∿260
0.28	C_3 alkylbenzene isomer	∿860
0.29	benzofuran (tentative)	NQ
0.30	trimethylbenzene isomer	∿1100
0.32	n-decane	200
0.32	C_3 alkylbenzene isomer	∿1200
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.42	n-undecane	330
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.47	naphthalene	∿3200
0.52	n-dodecane	480
0.58	methylnaphthalene isomer	∿1100
0.60	methylnaphthalene isomer	∿710
0.62	n-tridecane	320
0.71	n-tetradecane	180
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F175. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #010478-WS-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	n-decane	13
0.43	TMS-phenol	91
0.44	TMS derivatization artifact	
0.49	n-undecane	12
0.50	TMS derivatization artifact	
0.50	TMS-o-cresol	30
0.52	TMS-m-cresol	∿20
0.53	TMS-p-cresol	26
0.54	naphthalene	∿72
0.55	TMS derivatization artifact	
0.58	n-dodecane	10
0.67	n-tridecane	7
0.75	n-tetradecane	6
0.82	n-pentadecane	10
0.90	n-hexadecane	4
0.96	n-heptadecane	6
1.00	D-10 ANTHRACENE	IS
1.02	n-octadecane	3
1.09	n-nonadecane	3
1.14	n-eicosane	4
1.20	n-heneicosane	3
1.25	n-docosane	2
1.30	n-tricosane	8
1.35	n-tetracosane	15
1.40	n-pentacosane	16
1.41	bis-(2-ethylhexyl)phthalate	∿18
1.46	n-hexacosane	18
1.53	n-heptacosane	∿15
1.62	n-octacosane	∿14
1.73	n-nonacosane	∿10
1.87	n-triacontane	∿5

*Relative to the internal standard D-10 anthracene.

TABLE F176. LAWRENCE LIVERMORE SAMPLE #010478-WS-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	unknown	
0.19	xylene isomer	∿1800
0.20	C_2 alkylthiophene isomer (tentative)	NQ
0.20	xylene isomer	∿830
0.21	C_2 alkylthiophene isomer (tentative)	NQ
0.23	C_3 alkylbenzene isomer	∿61
0.26	unknown	
0.27	C_3 alkylbenzene isomer	∿390
0.27	trimethylbenzene isomer	∿210
0.28	C_3 alkylbenzene isomer	∿250
0.29	C_8H_6O isomer (tentative)	NQ
0.30	trimethylbenzene isomer	∿360
0.31	C_3 alkylthiophene isomer (tentative)	NQ
0.32	C_3 alkylbenzene isomer	∿350
0.33	C_4 alkylbenzene isomer	∿60
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.37	C_4 alkylbenzene isomer	∿34
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.42	C_4 alkylbenzene isomer	∿24
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.48	naphthalene	∿1500
0.48	benzothiophene isomer (tentative)	NQ
0.50	C_2 alkylbenzofuran isomer (tentative)	NQ
0.51	C_2 alkylbenzofuran isomer (tentative)	NQ
0.58	methylnaphthalene isomer	∿360
0.60	methylnaphthalene isomer	∿210
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F177. LAWRENCE LIVERMORE SAMPLE #010478-WS-8 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.38	C_{11} alkane	~35
0.41	n-undecane	72
0.44	impure $C_{10}H_8$ isomer (tentative)	NQ
0.47	naphthalene	~69
0.50	C_{12} alkane	~31
0.51	n-dodecane	40
0.61	C_{13} alkane	~40
0.61	n-tridecane	41
0.71	n-tetradecane	17
0.91	$C_{14}D_{12}$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F178. LAWRENCE LIVERMORE SAMPLE #010478-WS-8 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	C_3 alkylbenzene isomer	~97
0.36	trimethylbenzene isomer	~23
0.37	C_3 alkylbenzene isomer	~70
0.38	trimethylbenzene isomer	~110
0.39	decene	~10
0.40	n-decane	~54
0.40	trimethylbenzene isomer	~150
0.41	C_4 alkylbenzene isomer	~9
0.42	C_9H_{10} isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	~1
0.46	C_4 alkylbenzene isomer	~14
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.48	undecene	~66
0.49	n-undecane	170
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.53	C_4 alkylbenzene isomer	~79
0.55	naphthalene	~900
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	dimethylbenzofuran isomer (tentative)	NQ
0.57	dodecene	~14
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.58	n-dodecane	150
0.60	C_{13} alkane	~40
0.64	$C_{11}H_{14}$ isomer (tentative)	NQ
0.65	dimethylnaphthalene isomer	~210
0.65	C_{13} alkane	~33
0.66	dimethylnaphthalene isomer	~110
0.66	tridecene	~36
0.67	n-tridecane	120
0.71	biphenyl	70
0.73	ethylnaphthalene isomer	~9
0.74	dimethylnaphthalene isomer + C_{14} alkane	~77
0.74	tetradecene	~11
0.74	dimethylnaphthalene isomer	~34
0.75	n-tetradecane	140
0.77	C_2 alkylnaphthalene isomer	~19
0.79	acenaphthene	~35
0.80	C_{14} alkane	~29
0.83	n-pentadecane	190
0.85	trimethylnaphthalene isomer	~21
0.86	fluorene	26
0.87	diethyl phthalate	500
0.90	n-hexadecane	97
0.93	C_{17} alkane	~30

(continued)

TABLE F178. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.96	n-heptadecane	64
0.97	C_{18} alkane	∿24
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	35
1.09	n-nonadecane	26
1.15	n-eicosane	20
1.20	n-heneicosane	20
1.25	n-docosane	20
1.30	n-tricosane	23
1.35	n-tetracosane	20
1.40	n-pentacosane	20
1.46	n-hexacosane	13
1.53	n-heptacosane	∿14

*Relative to the internal standard D-10 anthracene.

TABLE F179. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #010478-WS-9 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.40	TMS derivatization artifact	
0.44	TMS-phenol	31
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.47	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
0.72	unknown	
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	10
1.30	n-tricosane	58
1.35	n-tetracosane	110
1.40	n-pentacosane	96
1.46	n-hexacosane	140
1.53	n-heptacosane	∿130
1.53	impure bis-(2-ethylhexyl)phthalate	∿150
1.53	n-octacosane	∿100
1.55	n-nonacosane	∿75

*Relative to the internal standard D-10 anthracene.

TABLE F180. LAWRENCE LIVERMORE SAMPLE #010678-WS-9 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.07	unknown	

*Relative to the internal standard D-10 anthracene.

TABLE F181. LAWRENCE LIVERMORE SAMPLE #011178-A A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	870
0.36	o-cresol	1100
0.38	p-cresol	3100
0.44	ethylphenol isomer	∿160
0.45	dimethylphenol isomer	∿300
0.47	impure C_2 alkylphenol isomer	∿170
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F182. LAWRENCE LIVERMORE SAMPLE #011778-A B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.16	ethylbenzene	7
0.17	xylene isomer	∿18
0.19	xylene isomer	∿21
0.26	C_3 alkylbenzene isomer	∿3
0.28	C_3 alkylbenzene isomer	∿8
0.30	C_3 alkylbenzene isomer	∿9
0.31	C_9H_{10} isomer	∿40
0.43	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	naphthalene	∿42
0.58	methylnaphthalene isomer	∿10
0.59	methylnaphthalene isomer	∿20
0.61	n-tridecane	4
0.66	biphenyl	7
0.69	dimethylnaphthalene isomer	∿10
0.70	dimethylnaphthalene isomer	∿9
0.70	dimethylnaphthalene isomer	∿14
0.71	n-tetradecane	3
0.75	acenaphthene	∿7
0.80	n-pentadecane	8
0.83	C_3 alkylnaphthalene isomer	∿7
0.84	fluorene	2
0.85	C_3 alkylnaphthalene isomer	∿5
0.88	n-hexadecane	6
0.96	n-heptadecane	4
1.00	$C_{14}H_{10}$ isomer	∿5
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	2
1.19	n-eicosane	2
1.25	n-heneicosane	1
1.32	n-docosane	2
1.38	n-tricosane	1
1.44	n-tetracosane	1
1.50	n-pentacosane	2
1.56	n-hexacosane	1

*Relative to the internal standard D-10 anthracene.

TABLE F183. LAWRENCE LIVERMORE SAMPLE #011778-B A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.25	phenol	180
0.31	C_6H_6O isomer (tentative)	NQ
0.33	o-cresol	220
0.37	m-cresol	∿720
0.40	p-cresol	1000
0.43	ethylphenol isomer	∿36
0.44	dimethylphenol isomer	∿44
0.44	ethylphenol isomer	∿180
0.46	dimethylphenol isomer	∿170
0.47	C_2 alkylphenol isomer	∿130
0.48	dimethylphenol isomer	∿73
0.49	dimethylphenol isomer	∿120
0.50	dimethylphenol isomer	∿130
0.53	C_3 alkylphenol isomer	∿5
0.54	C_3 alkylphenol isomer	∿13
0.56	ethylmethylphenol isomer	∿27
0.57	C_3 alkylphenol isomer	∿140
0.58	ethylmethylphenol isomer	∿17
0.61	ethylbenzaldehyde (tentative)	NQ
0.62	ethylbenzaldehyde (tentative)	NQ
0.63	C_2 alkylbenzaldehyde (tentative)	NQ
0.68	C_5 alkylbenzene isomer (tentative)	NQ
0.91	D-12 phenanthrene (tentative)	NQ
0.99	unknown	
1.00	D-10 ANTHRACENE	IS
1.28	bisphenol A (tentative)	NQ

*Relative to the internal standard D-10 anthracene.

TABLE F184. LAWRENCE LIVERMORE SAMPLE #011778-B B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.46	naphthalene	∿70
0.58	methylnaphthalene isomer	∿17
0.59	methylnaphthalene isomer	∿10
0.65	biphenyl	3
0.75	acenaphthene	∿12
0.79	C_{15} alkane	∿3
0.84	fluorene	12
0.88	C_{16} alkane	∿5
0.97	C_{17} alkane	∿2
1.00	$C_{14}H_{10}$ isomer	∿19
1.00	D-10 ANTHRACENE	IS
1.04	C_{18} alkane	∿89

*Relative to the internal standard D-10 anthracene.

TABLE F185. LAWRENCE LIVERMORE SAMPLE #021478-A A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	>370
0.36	cresol isomer	>650
0.44	ethylphenol isomer	∿1100
0.45	dimethylphenol isomer	∿370
0.47	C_2 alkylphenol isomer	∿260
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthrancene.

TABLE F186. LAWRENCE LIVERMORE SAMPLE #021478-A B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F187. LAWRENCE LIVERMORE SAMPLE #021478-C A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	∿8500
0.36	o-cresol	2000
0.38	p-cresol	12000
0.47	C_2 alkylphenol isomer	∿2000
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F188. LAWRENCE LIVERMORE SAMPLE #021478-C B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F189. LAWRENCE LIVERMORE SAMPLE #021478-WS-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.38	phenol	3500
0.44	o-cresol	520
0.46	p-cresol	3300
0.52	ethylphenol isomer	∿75
0.53	dimethylphenol isomer	∿57
0.55	dimethylphenol isomer	∿610
0.75	n-tetradecane	88
0.87	diethyl phthalate	150
1.00	D-10 ANTHRACENE	IS
1.20	n-heneicosane	2
1.31	n-tricosane	6
1.36	n-tetracosane	13
1.41	n-pentacosane	9
1.46	n-hexacosane	10
1.53	n-heptacosane	∿7

*Relative to the internal standard D-10 anthracene.

TABLE F190. LAWRENCE LIVERMORE SAMPLE #021478-WS-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.31	$C_8H_{11}N$ isomer (tentative)	NQ
0.47	naphthalene	~40
0.58	methylnaphthalene isomer	~6
0.60	methylnaphthalene isomer	~6
0.66	biphenyl	3
0.70	dimethylnaphthalene isomer	~2
0.75	acenaphthene	~4
0.80	n-pentadecane	2
0.84	fluorene	3
0.85	C_3 alkylnaphthalene isomer	~1
0.88	n-hexadecane	3
0.97	n-heptadecane	3
0.99	$C_{14}H_{10}$ isomer	~6
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	2
1.12	n-nonadecane	4
1.13	impure dibutyl phthalate isomer	~8
1.19	n-eicosane	3
1.20	$C_{16}H_{10}$ isomer (tentative)	NQ
1.26	n-heneicosane	4
1.32	n-docosane	3
1.38	n-tricosane	3
1.44	n-tetracosane	2
1.50	n-pentacosane	2
1.56	n-hexacosane	1

*Relative to the internal standard D-10 anthracene.

TABLE F191. LAWRENCE LIVERMORE SAMPLE #021478-WS-3 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	∿2200
0.36	cresol isomer	∿2600
0.40	dimethylphenol isomer	∿110
0.44	ethylphenol isomer	∿430
0.45	dimethylphenol isomer	∿960
0.47	C_2 alkylphenol isomer	∿1400
0.48	dimethylphenol isomer + $C_9H_{12}O$ isomer	∿360
0.50	dimethylphenol isomer	∿46
0.53	$C_9H_{12}O$ isomer	∿32
0.54	C_3 alkylphenol isomer	∿76
0.56	C_3 alkylphenol isomer	∿240
0.61	C_2 alkylbenzaldehyde isomer (tentative)	NQ
0.63	C_2 alkylbenzaldehyde isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.28	bisphenol isomer (tentative)	NQ

*Relative to the internal standard D-10 anthracene.

TABLE F192. LAWRENCE LIVERMORE SAMPLE #021478-WS-3 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	15
0.18	xylene isomer	∿42
0.20	xylene isomer	∿32
0.26	C_3 alkylbenzene isomer	∿2
0.30	trimethylbenzene isomer	∿5
0.32	trimethylbenzene isomer	∿7
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.45	trimethylbenzene isomer	∿26
0.47	naphthalene	∿110
0.53	C_3 alkylphenol isomer	∿13
0.54	C_3 alkylphenol isomer	∿15
0.58	methylnaphthalene isomer	∿12
0.60	methylnaphthalene isomer	∿19
0.84	fluorene	13
0.99	$C_{14}H_{10}$ isomer	∿18
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F193. LAWRENCE LIVERMORE SAMPLE #021478-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.17	ethylbenzene	140
0.18	xylene isomer	∿320
0.20	xylene isomer	∿160
0.22	n-nonane	32
0.26	C_8H_8O isomer (tentative)	NQ
0.26	C_3 alkylbenzene isomer	∿14
0.28	C_3 alkylbenzene isomer	∿49
0.29	phenol	∿800
0.30	trimethylbenzene isomer	∿230
0.32	n-decane	44
0.32	trimethylbenzene isomer	∿93
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.36	o-cresol	1900
0.39	cresol isomer	∿2200
0.40	impure dimethylphenol isomer	∿220
0.42	n-undecane	71
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.44	dimethylphenol isomer	∿420
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	dimethylphenol isomer	∿1000
0.48	naphthalene + dimethylphenol isomer	∿1800
0.48	C_3 alkylphenol isomer	∿530
0.52	n-dodecane	83
0.53	C_3 alkylphenol isomer	∿100
0.53	C_3 alkylphenol isomer + C_{13} alkane	∿160
0.54	C_3 alkylphenol isomer	∿130
0.56	C_3 alkylphenol isomer	∿270
0.58	methylnaphthalene isomer	∿160
0.60	methylnaphthalene isomer	∿74
0.62	n-tridecane	60
0.69	dimethylnaphthalene isomer + C_{14} alkane	∿54
0.71	n-tetradecane	45
0.80	n-pentadecane	66
0.88	n-hexadecane	41
0.90	$C_{15}H_{18}$ isomer (tentative)	NQ
0.97	n-heptadecane	11
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	18
1.09	unknown	
1.09	unknown	
1.11	unknown	
1.12	n-nonadecane	21
1.13	unknown	
1.18	unknown	

(continued)

TABLE F194. LAWRENCE LIVERMORE SAMPLE #021478-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	impure ethylbenzene	~520
0.18	xylene isomer	~510
0.19	dimethylthiophene isomer (tentative)	NQ
0.19	dimethylthiophene isomer (tentative)	NQ
0.20	xylene isomer	~290
0.22	n-nonane	71
0.23	C_3 alkylbenzene isomer	~71
0.26	C_9H_{12} isomer (tentative)	NQ
0.27	trimethylbenzene isomer	~230
0.28	C_3 alkylbenzene isomer	~380
0.29	benzofuran (tentative)	NQ
0.30	trimethylbenzene isomer	~550
0.32	n-decane	96
0.32	trimethylbenzene isomer	~540
0.33	C_4 alkylbenzene isomer	~65
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.36	C_4 alkylbenzene isomer	~72
0.37	C_4 alkylbenzene isomer	~39
0.38	C_4 alkylbenzene isomer	~84
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.38	C_4 alkylbenzene isomer	~64
0.40	methylbenzofuran isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.42	n-undecane	120
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	~260
0.47	naphthalene	~410
0.47	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane	170
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	methylnaphthalene isomer	~420
0.60	methylnaphthalene isomer	~220
0.61	n-tridecane	130
0.62	$C_{12}H_{16}$ isomer (tentative)	NQ
0.66	biphenyl	39
0.71	n-tetradecane	98
0.75	impure acenaphthene	~32
0.80	n-pentadecane	120
0.84	diethyl phthalate	3
0.88	n-hexadecane	34
0.90	C_5 alkylnaphthalene isomer (tentative)	NQ

(continued)

TABLE F194. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.93	C_{17} alkane	∿92
0.97	n-heptadecane	94
0.97	C_{18} alkane	∿56
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.04	n-octadecane	67
1.05	C_{19} alkane	∿44
1.10	unknown	
1.12	n-nonadecane	45
1.26	impure n-heneicosane	∿46
1.50	bis-(2-ethylhexyl)phthalate	∿160

*Relative to the internal standard D-10 anthracene.

TABLE F195. LAWRENCE LIVERMORE SAMPLE #021478-WS-8 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F196. LAWRENCE LIVERMORE SAMPLE #021478-WS-8 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	impure ethylbenzene	∿18
0.18	xylene isomer	∿35
0.20	dimethylthiophene isomer (tentative)	NQ
0.20	xylene isomer	∿19
0.23	C_3 alkylbenzene isomer	∿11
0.26	C_9H_{12} isomer (tentative)	NQ
0.27	trimethylbenzene isomer	∿23
0.27	trimethylbenzene isomer	∿25
0.28	C_3 alkylbenzene isomer	∿12
0.29	trimethylbenzene isomer	∿30
0.32	trimethylbenzene isomer	∿33
0.33	C_4 alkylbenzene isomer	∿24
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.35	C_4 alkylbenzene isomer	∿15
0.36	unknown	
0.36	C_4 alkylbenzene isomer	∿24
0.37	C_4 alkylbenzene isomer	∿15
0.38	C_4 alkylbenzene isomer	∿19
0.39	$C_{10}H_{12}$ isomer (tentative)	NQ
0.39	C_4 alkylbenzene isomer	∿19
0.39	impure C_4 alkylbenzene isomer	∿5
0.40	methylbenzofuran isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.42	C_4 alkylbenzene isomer	∿12
0.43	C_4 alkylbenzene isomer	∿20
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	∿28
0.48	unknown	
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	C_2 alkylbenzofuran isomer (tentative)	NQ
0.51	C_2 alkylbenzofuran isomer (tentative)	NQ
0.51	C_2 alkylbenzofuran isomer (tentative)	NQ
0.52	unknown	
0.55	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	unknown	
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ
0.59	methylnaphthalene isomer	∿32
0.60	methylnaphthalene isomer	∿56
0.60	$C_{12}H_{16}$ isomer (tentative)	NQ
0.61	impure n-tridecane	∿9
0.62	$C_{12}H_{16}$ isomer (tenative)	NQ

(continued)

TABLE F196. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.66	biphenyl	32
0.68	ethylnaphthalene isomer	∿10
0.69	dimethylnaphthalene isomer	∿21
0.70	dimethylnaphthalene isomer	∿19
0.70	dimethylnaphthalene isomer	∿33
0.72	C_2 alkylnaphthalene isomer	∿16
0.73	ethylnaphthalene isomer	∿9
0.75	acenaphthene	∿27
0.84	fluorene	14
0.85	C_3 alkylnaphthalene isomer	∿6
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F197. LAWRENCE LIVERMORE SAMPLE #041078-A A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	∿96
0.36	o-cresol	570
0.40	dimethylphenol isomer	∿54
0.44	ethylphenol isomer	∿150
0.45	dimethylphenol isomer	∿320
0.47	C_2 alkylphenol isomer	∿260
0.50	C_2 + C_3 alkylphenol isomer mixture	∿39
0.56	C_3 alkylphenol isomer	∿39
0.61	C_2 alkylbenzaldehyde (tentative)	NQ
0.64	C_2 alkylbenzaldehyde (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F198. LAWRENCE LIVERMORE SAMPLE #041078-A B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.20	xylene isomer	∿10
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F199. LAWRENCE LIVERMORE SAMPLE #041178-B A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.30	phenol	>1300
0.36	o-cresol	>4200
0.38	cresol isomer	>10000
0.44	ethylphenol isomer	~700
0.45	dimethylphenol isomer	~860
0.47	C_2 alkylphenol isomer	~4700
0.50	dimethylphenol isomer	~860
0.56	C_3 alkylphenol isomer	~520
0.61	$C_9H_{10}O$ isomer (tentative)	NQ
0.63	$C_9H_{10}O$ isomer (tentative)	NQ
0.85	diethyl phthalate (tentative)	NQ
0.96	n-heptadecane	30
1.00	D-10 ANTHRACENE	IS
1.01	unknown	
1.04	n-octadecane	35
1.10	unknown	
1.12	n-nonadecane	19
1.13	di-n-butyl phthalate	19
1.19	n-eicosane	9

*Relative to the internal standard D-10 anthracene.

TABLE F200. LAWRENCE LIVERMORE SAMPLE #041178-B B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.47	naphthalene	~60
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F201. LAWRENCE LIVERMORE SAMPLE #041178-WS-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	~1000
0.35	cresol isomer	~120
0.47	C_2 alkylphenol isomer	~150
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F202. LAWRENCE LIVERMORE SAMPLE #041178-WS-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylcyclopentanone (tentative)	NQ
0.19	C_2 alkylpyridine isomer	~4
0.47	naphthalene	~60
0.48	unknown	
0.54	C_3 alkylphenol isomer	~8
0.58	methylnaphthalene isomer	~51
0.60	methylnaphthalene isomer	~58
0.99	$C_{14}H_{10}$ isomer	~5
1.00	D-10 ANTHRACENE	IS
1.13	di-n-butyl phthalate	~13

*Relative to the internal standard D-10 anthracene.

TABLE F203. LAWRENCE LIVERMORE SAMPLE #041078-WS-3 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	cresol isomer	~400
0.48	dimethylphenol isomer	~130
1.00	D-10 ANTHRACENE	IS
1.13	di-n-butyl phthalate	7

*Relative to the internal standard D-10 anthracene.

TABLE F204. LAWRENCE LIVERMORE SAMPLES #041078-WS-3 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.14	tetrachloroethylene (tentative)	NQ
0.18	ethylbenzene	23
0.18	xylene isomer	~46
0.20	xylene isomer	~32
0.26	C_3 alkylbenzene isomer	~2
0.28	C_3 alkylbenzene isomer	~9
0.30	trimethylbenzene isomer	~11
0.32	trimethylbenzene isomer	~13
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_{10} isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.47	naphthalene	~120
0.58	methylnaphthalene isomer	~19
0.60	methylnaphthalene isomer	~14
0.99	$C_{14}H_{10}$ isomer	~12
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F205. LAWRENCE LIVERMORE SAMPLE #041078-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	81
0.18	xylene isomer	~200
0.20	xylene isomer	~110
0.27	C_3 alkylbenzene isomer	~7
0.29	phenol	~360
0.30	trimethylbenzene isomer	~200
0.32	n-decane	31
0.32	trimethylbenzene isomer	~53
0.33	C_9H_{10} isomer (tentative)	NQ
0.36	o-cresol	1200
0.38	p-cresol	1200
0.40	unknown	
0.42	n-undecane	52
0.44	ethylphenol isomer	~160
0.45	dimethylphenol isomer	~450
0.47	naphthalene	~350
0.52	n-dodecane	73
0.58	methylnaphthalene isomer	~82
0.60	methylnaphthalene isomer	~60
0.61	n-tridecane	50
0.71	n-tetradecane	39
0.80	n-pentadecane	54
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F206. LAWRENCE LIVERMORE SAMPLE #041078-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	ethylbenzene	∿4400
0.19	xylene isomer	∿10000
0.19	dimethylthiophene isomer (tentative)	NQ
0.19	dimethylthiophene isomer (tentative)	NQ
0.20	xylene isomer	∿5800
0.22	C_9 alkane	∿180
0.23	ethyltoluene isomer	∿88
0.26	C_8H_8O isomer (tentative)	NQ
0.27	trimethylbenzene isomer	∿410
0.27	trimethylbenzene isomer	∿280
0.28	ethyltoluene isomer	∿320
0.29	benzofuran (tentative)	NQ
0.29	trimethylbenzene isomer	∿390
0.32	n-decane	∿150
0.32	trimethylbenzene isomer	∿360
0.33	C_3 alkylbenzene isomer	∿89
0.33	C_9H_{10} isomer (tentative)	NQ
0.34	C_9H_8 isomer (tentative)	NQ
0.36	unknown	
0.36	C_4 alkylbenzene isomer	∿100
0.37	C_4 alkylbenzene isomer	∿91
0.38	C_4 alkylbenzene isomer	∿120
0.38	$C_{10}H_{12}$ isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.40	methylbenzofuran isomer (tentative)	NQ
0.42	n-undecane	∿230
0.44	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	$C_{10}H_{12}$ isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	∿410
0.48	naphthalene	∿10000
0.48	benzothiophene (tentative)	NQ
0.49	$C_{11}H_{14}$ isomer (tentative)	NQ
0.50	$C_{11}H_{14}$ isomer (tentative)	NQ
0.51	dimethylbenzofuran isomer (tentative)	NQ
0.52	n-dodecane	∿300
0.58	$C_{11}H_{14}$ isomer (tentative)	NQ
0.58	methylnaphthalene isomer	∿730
0.60	methylnaphthalene isomer	∿450
0.61	n-tridecane	∿220
0.66	biphenyl	∿65
0.69	dimethylnaphthalene isomer + ∿C_{14} alkane	∿170
0.70	dimethylnaphthalene isomer	∿55
0.71	n-tetradecane	∿160
0.75	acenaphthene	∿160
0.77	∿C_{16} alkane	∿50

(continued)

TABLE F206. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.79	$C_{13}H_{16}O$ isomer (tentative)	NQ
0.80	n-pentadecane	∿170
0.85	C_3 alkylnaphthalene isomer	∿99
0.89	n-hexadecane	∿150
0.97	n-heptadecane	∿45
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	∿42
1.50	bis-(2-ethylhexyl) phthalate	∿150

*Relative to the internal standard D-10 anthracene.

TABLE F207. LAWRENCE LIVERMORE SAMPLE #041078-WS-8 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	unknown phthalate (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F208. LAWRENCE LIVERMORE SAMPLE #041078-WS-8 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	C_3 alkylbenzene isomer	∿28
0.36	C_3 alkylbenzene iosmer	∿17
0.37	trimethylbenzene isomer	∿26
0.40	trimethylbenzene isomer	∿27
0.41	C_9H_{10} isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	∿5
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.54	naphthalene	∿200
0.64	methylnaphthalene isomer	∿53
0.87	diethyl phthalate	∿130
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F209. LAWRENCE LIVERMORE HOE CREEK DERIVATIZED SAMPLE #061378-A A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS-phenol	22
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.50	TMS-o-cresol	210
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
0.57	TMS-C_2 alkylphenol isomer	~13
0.58	TMS-dimethylphenol isomer	~13
0.59	TMS-ethylphenol isomer	~13
0.59	TMS-dimethylphenol isomer	~27
0.60	TMS-dimethylphenol isomer	~2
0.61	TMS-dimethylphenol isomer	~8
0.62	TMS-dimethylphenol isomer	~11
0.66	TMS-C_3 alkylphenol isomer	~36
0.72	C_8-alkylphenol isomer	~14
0.74	C_8-alkylphenol isomer	~13
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	1
1.30	n-tricosnae	5
1.35	n-tetracosane	11
1.40	n-pentacosane	14
1.46	n-hexacosane	15
1.53	n-heptacosane	~14
1.62	n-octacosane	~9

*Relative to the internal standard D-10 anthracene.

TABLE F210. LAWRENCE LIVERMORE SAMPLE #061378-A B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.61	n-tridecane	14
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 anthracene.

TABLE F211. LAWRENCE LIVERMORE HOE CREEK DERIVATIZED SAMPLE #061378-WS-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS-phenol	1600
0.44	TMS derivatization artifact	
0.47	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.51	TMS-o-cresol	1200
0.52	TMS-m-cresol	~400
0.53	TMS-p-cresol	310
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.56	TMS-C_2 alkylphenol isomer	~72
0.58	TMS-dimethylphenol isomer	~120
0.59	TMS-ethylphenol isomer	~740
0.59	TMS-dimethylphenol isomer	~190
0.60	TMS-ethylphenol isomer	~280
0.61	TMS-dimethylphenol isomer	~140
0.62	TMS-C_2 alkylphenol isomer	~83
0.65	TMS-C_2 alkylphenol isomer	~100
0.66	TMS-C_3 alkylphenol isomer	~130
0.72	C_8 alkylphenol isomer	~280
0.74	C_8 alkylphenol isomer	~400
0.97	unknown	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	26
1.34	n-tetracosane	42
1.39	n-pentacosane	55
1.45	n-hexacosane	61
1.52	n-heptacosane	~31
1.61	n-octacosane	~36

*Relative to the internal standard D-10 anthracene.

TABLE F212. LAWRENCE LIVERMORE SAMPLE #061378-WS-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.24	ethylbenzene	2
0.25	xylene isomer	∿2
0.27	xylene isomer	∿2
0.35	C_6H_7N isomer (tentative)	NQ
0.39	unknown	
0.40	C_9H_{10} isomer (tentative)	NQ
0.48	dimethylphenol isomer	∿31
0.52	C_2 alkylphenol isomer	∿10
0.53	dimethylphenol isomer	∿25
0.54	naphthalene	∿21
0.55	dimethylphenol isomer	∿57
0.61	C_3 alkylphenol isomer	∿28
0.63	C_3 alkylphenol isomer	∿20
0.63	C_3 alkylphenol isomer	∿17
0.65	methylnaphthalene isomer	∿2
0.79	acenaphthene	∿4
0.99	$C_{14}H_{10}$ isomer	∿2
1.00	D-10 ANTHRACENE	IS
1.10	di-n-butyl phthalate	3
1.26	n-docosane	1

*Relative to the internal standard D-10 anthracene.

TABLE F213. LAWRENCE LIVERMORE HOE CREEK DERIVATIZED SAMPLE #061378-WS-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS-phenol	37
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.48	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	140
0.52	TMS-m-cresol	∿11
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
0.57	TMS-C_2 alkylphenol isomer	∿13
0.58	TMS-dimethylphenol isomer	∿19
0.59	TMS-ethylphenol isomer	∿50
0.59	TMS-dimethylphenol isomer	∿49
0.60	TMS-C_2 alkylphenol isomer	∿11
0.61	TMS-dimethylphenol isomer	∿12
0.62	TMS-C_2 alkylphenol isomer	∿14
0.66	TMS-C_3 alkylphenol isomer	∿64
0.72	C_8 alkylphenol isomer	∿30
0.74	C_8 alkylphenol isomer	∿28
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	3
1.30	n-tricosane	15
1.35	n-tetracosane	21
1.40	n-pentacosane	24
1.46	n-hexacosane	33
1.53	n-heptacosane	∿27
1.62	n-octacosane	∿23
1.73	n-nonacosane	∿16

*Relative to the internal standard D-10 anthracene.

TABLE F214. LAWRENCE LIVERMORE SAMPLE #061378-WS-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.26	dimethylpyridine isomer	~18
0.37	C_3 alkylbenzene isomer	~6
0.40	C_3 alkylbenzene isomer + unknown	~21
0.41	C_9H_{10} isomer (tentative)	NQ
0.45	C_4 alkylbenzene isomer	~14
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	C_4 alkylbenzene isomer	~12
0.47	methylbenzofuran isomer (tentative)	NQ
0.48	methylbenzofuran isomer (tentative)	NQ
0.48	C_4 alkylbenzene isomer	~3
0.49	C_4 alkylbenzene isomer	~12
0.49	C_4 alkylbenzene isomer	~24
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	C_4 alkylbenzene isomer	~32
0.54	naphthalene	~180
0.55	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	dimethylbenzofuran isomer (tentative)	NQ
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.61	C_3 alkylphenol isomer	~2
0.64	$C_{11}H_{14}$ isomer (tentative)	NQ
0.64	methylnaphthalene isomer	~62
0.66	methylnaphthalene isomer	~53
0.71	biphenyl	22
0.73	ethylnaphthalene isomer	~6
0.74	dimethylnaphthalene isomer	~24
0.75	dimethylnaphthalene isomer	~16
0.75	dimethylnaphthalene isomer	~34
0.76	dimethylnaphthalene isomer	~13
0.77	ethylnaphthalene isomer	~12
0.79	acenaphthene	~13
0.82	dibenzofuran	20
0.85	C_3 alkylnaphthalene isomer	~15
0.87	fluorene	31
0.87	C_3 alkylnaphthalene isomer	~14
0.99	$C_{14}H_{10}$ isomer	~20
1.00	D-10 ANTHRACENE	IS
1.10	di-n-butyl phthalate	3

*Relative to the internal standard D-10 anthracene.

TABLE F215. LAWRENCE LIVERMORE HOE CREEK DERIVATIZED SAMPLE #061378-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	n-decane	7
0.40	trimethylbenzene isomer	~980
0.41	C_9H_{10} isomer (tentative)	NQ
0.43	TMS-phenol	112
0.44	TMS derivatization artifact	
0.49	n-undecane	9
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	250
0.52	TMS-m-cresol	~82
0.52	TMS-p-cresol	85
0.54	TMS derivatization artifact	
0.54	naphthalene	~134
0.55	TMS derivatization artifact	
0.57	TMS-C_2 alkylphenol isomer	~36
0.58	TMS-dimethylphenol isomer	~42
0.59	TMS-ethylphenol isomer	~73
0.59	TMS-dimethylphenol isomer	~69
0.60	TMS-C_2 alkylphenol isomer	~40
0.61	TMS-dimethylphenol isomer	~13
0.62	TMS-dimethylphenol isomer	~13
0.64	TMS-C_3 alkylphenol isomer	~20
0.65	TMS-C_3 alkylphenol isomer	~84
0.66	TMS-C_3 alkylphenol isomer	~29
0.67	TMS-C_3 alkylphenol isomer	~73
0.68	TMS-C_3 alkylphenol isomer	~61
0.73	C_8 alkylphenol isomer	~8
0.74	C_8 alkylphenol isomer	~5
0.75	n-tetradecane	9
0.82	n-pentadecane	25
0.90	n-hexadecane	11
0.96	n-heptadecane	9
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	5
1.09	n-nonadecane	4
1.14	n-eicosane	3
1.20	n-heneicosane	3
1.25	n-docosane	11
1.30	n-tricosane	9
1.35	n-tetracosane	12
1.40	n-pentacosane	22

(continued)

TABLE F215. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.41	bis-(2-ethylhexyl)phthalate	34
1.46	n-hexacosane	20
1.53	n-heptacosane	∿19
1.62	n-octacosane	∿14
1.73	n-nonacosane	∿13
1.86	n-triacontane	∿5

*Relative to the internal standard D-10 anthracene.

TABLE F216. LAWRENCE LIVERMORE SAMPLE #061378-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.24	ethylbenzene	2400
0.25	xylene isomer	~5800
0.25	C_6H_8S isomer (tentative)	NQ
0.26	C_6H_8S isomer (tentative)	NQ
0.27	xylene isomer	~3500
0.28	C_6H_8S isomer (tentative)	NQ
0.30	C_3 alkylbenzene isomer	~140
0.34	C_3 alkylbenzene isomer	~1500
0.35	trimethylbenzene isomer	~360
0.36	C_3 alkylbenzene isomer	~760
0.37	benzofuran (tentative)	NQ
0.37	trimethylbenzene isomer	~1200
0.39	n-decane	96
0.40	C_3 alkylbenzene isomer	~1400
0.41	C_9H_{10} isomer (tentative)	NQ
0.41	C_9H_8 isomer (tentative)	NQ
0.44	C_4 alkylbenzene isomer	~110
0.44	C_4 alkylbenzene isomer	~80
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	C_4 alkylbenzene isomer	~27
0.47	methylbenzofuran isomer (tentative)	NQ
0.47	methylbenzofuran isomer (tentative)	NQ
0.48	methylbenzofuran isomer (tentative)	NQ
0.49	n-undecane	230
0.49	C_4 alkylbenzene isomer	~95
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.55	naphthalene	~5480
0.55	C_8H_6S isomer (tentative)	NQ
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.58	n-dodecane	200
0.64	methylnaphthalene isomer	~790
0.66	methylnaphthalene isomer	~510
0.67	n-tridecane	160
0.71	biphenyl	110
0.75	n-tetradecane	310
0.79	acenaphthene	~11
0.80	C_{15} alkane	~47
0.83	n-pentadecane	170
0.90	n-hexadecane	98
0.97	n-heptadecane	78
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	37
1.09	n-nonadecane	27
1.15	n-eicosane	25
1.21	n-heneicosane	31

(continued)

TABLE F216. (continued).

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.26	n-docosane	21
1.31	n-tricosane	22
1.36	n-tetracosane	21

*Relative to the internal standard D-10 anthracene.

TABLE F217. LAWRENCE LIVERMORE HOE CREEK DERIVATIZED SAMPLE #061378-WS-6 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	n-decane	59
0.43	TMS-phenol	400
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.49	n-undecane	130
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	660
0.52	TMS-m-cresol	∿350
0.53	TMS-p-cresol	290
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
0.57	TMS-C_2 alkylphenol isomer	∿60
0.58	n-dodecane	320
0.59	TMS-ethylphenol isomer	∿100
0.59	TMS-dimethylphenol isomer	∿50
0.60	TMS-ethylphenol isomer	∿150
0.66	n-tridecane	160
0.74	n-tetradecane	92
0.82	n-pentadecane	210
0.89	n-hexadecane	87
0.96	n-heptadecane	77
1.00	D-10 ANTHRACENE	IS
1.08	n-nonadecane	40
1.14	n-eicosane	43
1.16	TMS-$C_{16}H_{32}O_2$ acid isomer	∿140
1.19	n-heneicosane	52
1.25	unknown	
1.30	n-tricosane	120
1.34	n-tetracosane	190
1.39	n-pentacosane	210
1.45	n-hexacosane	260
1.52	n-heptacosane	∿210
1.54	unknown	
1.61	n-octacosane	∿160
1.72	n-nonacosane	∿120
1.86	n-triacontane	∿9

*Relative to the internal standard D-10 anthracene.

TABLE F218. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #061378-WS-8 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS-phenol	50
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.48	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.59	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	60
1.30	n-tricosane	71
1.34	n-tetracosane	170
1.40	n-pentacosane	210
1.46	n-hexacosane	220
1.53	n-heptacosane	~140
1.61	n-nonacosane	~130

*Relative to the internal standard D-10 Anthracene.

TABLE F219. LAWRENCE LIVERMORE HOE CREEK SAMPLE #061378-WS-8 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	C_3 alkylbenzene isomer	~300
0.35	trimethylbenzene isomer	~71
0.36	C_3 alkylbenzene isomer	~220
0.37	trimethylbenzene isomer	~310
0.40	trimethylbenzene isomer	~330
0.40	C_4 alkylbenzene isomer	~35
0.41	C_9H_{10} isomer (tentative)	NQ
0.43	C_4 alkylbenzene isomer	~45
0.44	impure C_4 alkylbenzene isomer	~50
0.44	C_4 alkylbenzene isomer	~48
0.45	C_4 alkylbenzene isomer	~63
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.46	C_4 alkylbenzene isomer	~100
0.46	C_4 alkylbenzene isomer	~14
0.48	C_4 alkylbenzene isomer	~81
0.49	C_4 alkylbenzene isomer	~11
0.49	C_4 alkylbenzene isomer	~38
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	C_4 alkylbenzene isomer	~310
0.54	naphthalene	~340
0.55	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	dimethylbenzofuran isomer (tentative)	NQ
0.57	dimethylbenzofuran isomer (tentative)	NQ
0.58	impure $C_{11}H_{14}$ isomer (tentative)	NQ
0.62	$C_{11}H_{14}$ isomer (tentative)	NQ
0.63	$C_{11}H_{14}$ isomer (tentative)	NQ
0.64	methylnaphthalene isomer	~560
0.65	methylnaphthalene isomer	~450
0.73	dimethylnaphthalene isomer	~69
0.75	dimethylnaphthalene isomer	~210
0.79	acenaphthene	~55
0.87	diethyl phthalate	1400
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-1- Anthracene.

TABLE F220. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	n-decane	3
0.42	TMS-phenol	36
0.43	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.50	TMS-o-cresol	28
0.51	TMS-m-cresol	∿5
0.52	TMS-p-cresol	3
0.54	TMS derivatization artifact	
0.58	TMS-ethylphenol isomer	∿6
0.59	TMS-C_2 alkylphenol isomer	∿3
0.61	TMS-dimethylphenol isomer	∿3
0.92	$C_{15}H_{39}O_3NSi_3$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.17	TMS-n-hexadecanoic acid	∿70
1.31	n-tricosane	3
1.36	n-tetracosane	6
1.41	n-pentacosane	6
1.46	n-hexacosane	7
1.53	n-heptacosane	∿7
1.60	n-octacosane	∿5
1.70	n-nonacosane	∿3

*Relative to the internal standard D-10 Anthracene.

TABLE F221. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	4
1.30	n-tricosane	6
1.35	n-tetracosane	11
1.40	n-pentacosane	12
1.46	n-hexacosane	13
1.53	n-heptacosane	~13
1.62	n-octacosane	~11
1.73	n-nonacosane	~8

*Relative to the internal standard D-10 Anthracene.

TABLE F222. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-3 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.42	TMS-phenol	5
0.43	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.50	TMS-o-cresol	200
0.51	TMS-cresol isomer	∿4
0.54	TMS derivatization artifact	
0.56	TMS-C_2 alkylphenol isomer	∿19
0.57	TMS-dimethylphenol isomer	∿22
0.58	TMS-C_2 alkylphenol isomer	∿7
0.59	TMS-C_2 alkylphenol isomer	∿20
0.60	TMS-dimethylphenol isomer	∿8
0.61	TMS-dimethylphenol isomer	∿12
0.62	TMS-C_2 alkylphenol isomer	∿19
0.65	TMS-C_3 alkylphenol isomer	∿13
0.66	TMS-C_3 alkylphenol isomer	∿10
0.72	C_8 alkylphenol isomer	∿22
0.93	$C_{15}H_{39}O_3NSi_3$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.17	TMS-n-hexadecanoic acid	∿56
1.31	n-tricosane	4
1.36	n-tetracosane	6
1.41	n-pentacosane	7
1.46	n-hexacosane	8
1.53	n-heptacosane	∿8
1.60	n-octacosane	∿6
1.70	n-nonacosane	∿5

*Relative to the internal standard D-10 Anthracene.

TABLE F223. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-3 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	11
1.34	n-tetracosane	17
1.39	n-pentacosane	27
1.45	n-hexacosane	28
1.52	n-heptacosane	∿22
1.61	n-octacosane	∿19

*Relative to the internal standard D-10 Anthracene.

TABLE F224. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-5 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS-phenol	56
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.50	TMS-o-cresol	220
0.51	TMS-m-cresol	∿60
0.52	TMS-p-cresol	50
0.53	TMS derivatization artifact	
0.54	naphthalene	∿27
0.54	TMS derivatization artifact	
0.56	TMS-C_2 alkylphenol isomer	∿42
0.58	TMS-dimethylphenol isomer	∿5
0.58	TMS-ethylphenol isomer	∿56
0.59	TMS-dimethylphenol isomer	∿27
0.60	TMS-C_2 alkylphenol isomer	∿57
0.61	TMS-dimethylphenol isomer	∿22
0.62	TMS-C_2 alkylphenol isomer	∿18
0.63	TMS-C_2 and C_3 alkylphenol isomers	∿11
0.64	TMS-C_3 alkylphenol isomer	∿16
0.64	TMS-C_3 alkylphenol isomer	∿45
0.65	TMS-C_3 alkylphenol isomer	∿19
0.65	TMS-C_3 alkylphenol isomer	∿38
0.66	TMS-C_3 alkylphenol isomer	∿47
0.68	TMS-C_3 alkylphenol isomer	∿55
0.69	TMS-toluic acid isomer	∿6
0.72	C_8 alkylphenol isomer	∿10
0.74	C_8 alkylphenol isomer	∿23
0.93	$C_{15}H_{39}O_3NSi_3$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.31	n-tricosane	3
1.36	n-tetracosane	6
1.41	n-pentacosane	6
1.46	n-hexacosane	7
1.53	n-heptacosane	∿6
1.60	n-octacosane	∿5
1.70	n-nonacosane	∿3

*Relative to the internal standard D-10 Anthracene.

TABLE F225. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-5 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylbenzene isomer	>20000
0.40	n-decane	68
0.40	trimethylbenzene isomer	>20000
0.41	o-methylstyrene (tentative)	NQ
0.42	C_9H_8 isomer (tentative)	NQ
0.44	TMS derivatization artifact	
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.47	methylbenzofuran isomer (tentative)	NQ
0.48	methylbenzofuran isomer (tentative)	NQ
0.49	n-undecane	110
0.50	TMS derivatization artifact	
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{14}$ isomer	∿380
0.55	naphthalene	∿2000
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.58	n-dodecane	160
0.60	branched alkane (tentative)	NQ
0.64	methylnaphthalene isomer	∿340
0.66	methylnaphthalene isomer	∿280
0.67	n-tridecane	110
0.71	biphenyl	27
0.75	n-tetradecane	96
0.80	branched alkane (tentative)	NQ
0.83	n-pentadecane	190
0.90	n-hexadecane	100
0.96	n-heptadecane	∿60
0.99	alkene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	33
1.09	n-nonadecane	25
1.15	n-eicosane	38
1.20	n-heneicosane	19
1.25	n-docosane	19
1.30	n-tricosane	24
1.35	n-tetracosane	27
1.40	n-pentacosane	40
1.41	bis(2-ethylhexyl) phthalate	91
1.46	n-hexacosane	33
1.53	n-heptacosane	∿34
1.62	n-octacosane	∿35

*Relative to the internal standard D-10 Anthracene.

TABLE F226. LAWRENCE LIVERMORE SAMPLE #092178-WS-6 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	n-octane	33
0.25	ethylbenzene	39
0.26	p-xylene	88
0.28	o-xylene	37
0.29	nonene	∿16
0.30	nonene	∿9
0.30	n-nonane	78
0.34	C_3 alkylbenzene isomer	∿12
0.34	C_{10} alkane	∿13
0.35	C_3 alkylbenzene isomer	∿43
0.35	trimethylbenzene isomer	∿16
0.36	C_3 alkylbenzene isomer	∿35
0.37	trimethylbenzene isomer	∿41
0.38	decene	∿15
0.40	n-decane	91
0.41	∿ C_{11} alkene (tentative) + unknown	NQ
0.42	methylstyrene isomer	∿53
0.42	C_9H_8 isomer (tentative)	NQ
0.42	C_{11} alkane	∿13
0.43	C_4 alkylbenzene isomer	∿20
0.45	$C_{10}H_{14}$ isomer	∿9
0.46	$C_{10}H_{12}$ isomer (tentative) + C_{11} alkane	∿20
0.48	undecene	∿49
0.49	n-undecane	120
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.53	C_4 alkylbenzene isomer	∿23
0.55	naphthalene	∿150
0.56	C_{12} alkane	∿13
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	dodecene	∿32
0.59	n-dodecane	100
0.60	C_{13} alkane	∿33
0.62	unknown	
0.64	$C_{11}H_{14}$ isomer (tentative)	NQ
0.65	methylnaphthalene isomer	∿30
0.65	C_{13} alkane	∿10
0.66	methylnaphthalene isomer	∿30
0.66	impure tridecene	∿22
0.67	n-tridecane	71
0.71	biphenyl + unknown	∿21
0.74	C_2alkylnaphthalene isomer (tentative) + C_{14} alkane	∿26

(continued)

TABLE F226. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.74	tetradecene	∿15
0.75	n-tetradecane	81
0.80	C_{15} alkane	∿36
0.83	unknown	
0.83	n-pentadecane	71
0.85	trimethylnaphthalene isomer	∿15
0.86	fluorene	2
0.87	diethyl phthalate	26
0.87	C_3 alkylnaphthalene isomer	∿9
0.89	hexadecene	∿17
0.90	n-hexadecane	67
0.94	∿ C_{16}-C_{17} alkane (tentative) + unknown	NQ
0.96	heptadecene	∿18
0.97	n-heptadecane	50
0.99	$C_{14}H_{10}$ isomer + C_{18} alkene	∿34 ∿20
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	∿3
1.03	n-octadecane	22
1.04	C_{19} alkane	∿3
1.10	n-nonadecane	18
1.15	n-eicosane	21
1.20	n-heneicosane	22
1.26	n-docosane	20
1.31	n-tricosane	25
1.36	n-tetracosane	17
1.41	n-pentacosane	25
1.41	bis-(2-ethylhexyl)phthalate	∿24
1.46	n-hexacosane	17
1.53	n-heptacosane	∿17
1.55	$C_{24}H_{38}O_4$ isomer (tentative)	NQ
1.61	n-octacosane	∿11
1.67	impure phthalate (tentative)	NQ
1.70	impure phthalate (tentative)	NQ
1.71	n-nonacosane	15

*Relative to the internal standard D-10 Anthracene.

TABLE F227. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-6 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.36	C_3 alkylbenzene isomer	~6200
0.38	trimethylbenzene isomer	>20000
0.39	decene	~110
0.40	n-decane	~740
0.40	trimethylbenzene isomer	~20000
0.41	C_9H_{10} isomer (tentative)	NQ
0.42	C_9H_8 isomer (tentative)	NQ
0.46	unknown	
0.46	C_4 alkylbenzene isomer	~130
0.48	undecene	~290
0.49	n-undecane	820
0.51	TMS derivatization artifact	
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	unknown	
0.52	C_4 alkylbenzene isomer	~520
0.55	naphthalene	~2200
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	dodecene	~190
0.58	dimethylbenzofuran (tentative)	NQ
0.59	n-dodecane	640
0.60	C_{13} alkane	~140
0.62	unknown	
0.64	$C_{11}H_{14}$ isomer (tentative)	NQ
0.65	methylnaphthalene isomer	~690
0.65	C_{13} alkane	~100
0.66	methylnaphthalene isomer	~350
0.66	~C_{13} alkene + $C_{12}H_{16}$ isomer (tentative)	~160
0.66	~C_{13} alkene	~21
0.67	n-tridecane	500
0.70	$C_{13}H_{18}$ isomer (tentative)	NQ
0.71	unknown	
0.72	C_{14} alkane	~27
0.73	C_2 alkylnaphthalene isomer	~66
0.74	C_{14} alkane + C_2 alkylnaphthalene isomer	~46
0.74	tetradecene	~52
0.75	n-tetradecane	530
0.76	~C_{15} alkene	~100
0.77	C_2 alkylnaphthalene isomer	~84
0.78	C_{15} alkene	~100
0.80	C_{15} alkane	~340
0.80	$C_{14}H_{20}$ isomer (tentative)	NQ

(continued)

TABLE F227. (continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.82	pentadecene	∿180
0.83	n-pentadecane	960
0.84	∿C_{16} alkene	∿73
0.86	trimethylnaphthalene isomer	∿76
0.87	fluorene	140
0.87	C_3 alkylnaphthalene isomer	∿100
0.89	hexadecene	∿55
0.90	n-hexadecane	500
0.93	impure C_{17} alkane	∿180
0.96	heptadecene	∿120
0.97	n-heptadecane	340
0.97	C_{18} alkane	∿76
0.99	∿C_{18} alkene	∿54
0.99	∿C_{18} alkene	∿100
1.00	$C_{14}H_{10}$ isomer	∿75
1.00	D-10 ANTHRACENE	IS
1.02	octadecene	∿27
1.03	n-octadecane	180
1.04	C_{19} alkane	∿21
1.09	nonadecene	∿28
1.09	n-nonadecane	150
1.15	n-eicosane	210
1.18	unknown	
1.20	impure C_{21} alkene	∿31
1.20	n-heneicosane	120
1.25	n-docosane	120
1.30	tricosene	∿20
1.31	n-tricosane	150
1.35	n-tetracosane	140
1.41	n-pentacosane	230
1.41	bis-(2-ethylhexyl)phthalate	∿120
1.46	n-hexacosane	160
1.54	n-heptacosane	∿140
1.56	phthalate (tentative) + unknown	NQ
1.62	n-octacosane	∿120
1.72	C_{29} alkane (tentative) + phthalate	∿24
1.74	n-nonacosane	∿110
1.87	n-triacontane	∿44
2.04	n-hentriacontane	∿1

*Relative to the internal standard D-10 Anthracene.

TABLE F228. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-8 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.42	TMS-phenol	230
0.54	unknown	
1.00	D-10 ANTHRACENE	IS
1.26	n-docosane	300
1.31	n-tricosane	690
1.36	n-tetracosane	830
1.41	n-pentacosane	1200
1.41	bis-(2-ethylhexyl)phthalate	∿1500
1.46	n-hexacosane	1300
1.52	n-heptacosane	∿1100
1.60	n-octacosane	∿650
1.69	n-nonacosane	∿590

*Relative to the internal standard D-10 Anthracene.

TABLE F229. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #092178-WS-8 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.40	trimethylbenzene isomer	>20000
0.41	C_4 alkylbenzene isomer	∿500
0.41	C_9H_{10} isomer (tentative)	NQ
0.44	TMS derivatization artifact	
0.46	unknown	
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.47	TMS derivatization artifact	
0.48	TMS derivatization artifact	
0.50	C_4 alkylbenzene isomer	∿1200
0.50	TMS derivatization artifact	
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.51	unknown	
0.52	C_4 alkylbenzene isomer	∿4300
0.54	TMS derivatization artifact	
0.54	naphthalene	∿7500
0.55	TMS derivatization artifact	
0.64	methylnaphthalene isomer	∿2000
0.65	methylnaphthalene isomer	∿750
1.00	D-10 ANTHRACENE	IS
1.24	n-docosane	160
1.29	n-tricosane	220
1.34	n-tetracosane	400
1.39	n-pentacosane	650
1.45	n-hexacosane	680
1.51	n-heptacosane	∿460
1.60	n-octacosane	∿440
1.71	n-nonacosane	∿290

*Relative to the internal standard D-10 Anthracene.

TABLE F230. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #113178-WS-10 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.38	trimethylbenzene isomer	∿700
0.43	TMS-phenol	710
0.49	TMS derivatization artifact	
0.50	TMS-o-cresol	600
0.51	TMS-m-cresol	∿820
0.52	TMS-p-cresol	540
0.53	naphthalene	∿76
0.56	TMS-C_2 alkylphenol isomer	∿68
0.57	TMS-dimethylphenol isomer	∿92
0.58	TMS-C_2 alkylphenol isomer	∿160
0.59	TMS-dimethylphenol isomer	∿400
0.60	TMS-dimethylphenol isomer	∿1100
0.61	TMS-dimethylphenol isomer	∿92
0.62	TMS-C_2 alkylphenol isomer	∿130
0.63	TMS-C_3 alkylphenol isomer	∿20
0.64	TMS-C_3 alkylphenol isomer	∿93
0.65	TMS-C_3 alkylphenol isomer	∿62
0.65	TMS-C_3 alkylphenol isomer	∿34
0.66	TMS-C_3 alkylphenol isomer	∿23
0.67	TMS-C_3 alkylphenol isomer	∿70
0.68	TMS-toluic acid isomer	∿270
0.71	TMS-C_4 alkylphenol isomer	∿8
0.71	TMS-C_3 alkylphenol isomer	∿18
0.72	C_8 alkylphenol isomer	∿59
0.74	C_8 alkylphenol isomer	∿170
0.92	tri(TMS ether)-triethanolamine (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.31	n-tricosane	4
1.36	n-tetracosane	9
1.41	n-pentacosane	8
1.46	n-hexacosane	9
1.52	n-heptacosane	∿8
1.60	n-octacosane	∿7

*Relative to the internal standard D-10 Anthracene.

TABLE F231. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #113178-WS-10 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.38	trimethylbenzene isomer	∿9700
0.38	TMS derivatization artifact	
0.40	trimethylbenzene isomer	∿9400
0.41	C_9H_{10} isomer (tentative)	NQ
0.41	C_8H_{14} isomer (tentative)	NQ
0.42	C_9H_8 isomer (tentative)	NQ
0.44	TMS-phenol	200
0.45	TMS derivatization artifact	
0.48	methylbenzofuran isomer (tentative)	NQ
0.50	TMS derivatization artifact	
0.51	TMS-o-cresol	520
0.52	TMS-m-cresol	∿460
0.53	TMS-p-cresol	290
0.55	naphthalene	∿1400
0.57	TMS-C_2 alkylphenol isomer	∿160
0.59	TMS-dimethylphenol isomer	∿220
0.60	TMS-dimethylphenol isomer	∿550
0.61	TMS-C_2 alkylphenol isomer	∿300
0.62	TMS-dimethylphenol isomer	∿120
0.63	TMS-C_2 alkylphenol isomer	∿110
0.63	TMS-C_2 + C_3 alkylphenol isomers	∿49
0.64	TMS-C_3 alkylphenol isomer	∿140
0.64	methylnaphthalene isomer	∿190
0.65	TMS-C_3 alkylphenol isomer	∿320
0.66	TMS-C_3 alkylphenol isomer	∿160
0.66	TMS-C_3 alkylphenol isomer	∿91
0.67	TMS-C_3 alkylphenol isomer	∿210
0.68	TMS-C_3 alkylphenol isomer	∿610
0.69	TMS-C_3 alkylphenol isomer	∿100
0.70	unknown	
0.70	TMS-C_3 alkylphenol isomer	∿180
0.71	TMS-C_4 alkylphenol isomer	∿110
0.72	TMS-C_3 alkylphenol isomer	∿130
0.73	C_8 alkylphenol isomer	∿200
0.73	TMS-C_4 alkylphenol isomer	∿160
0.74	TMS-C_3 + C_4 alkylphenol isomers	∿180
0.75	C_8 alkylphenol isomer	∿820
0.76	unknown	
0.76	unknown	
0.77	unknown	
0.78	unknown	

(Continued)

TABLE F231. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.79	unknown	
0.79	acenaphthene	∿160
0.80	unknown	
0.81	unknown	
0.82	unknown	
0.84	unknown	
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	2
1.30	n-tricosane	5
1.35	n-tetracosane	9
1.40	n-pentacosane	11
1.46	n-hexacosane	14
1.53	n-heptacosane	∿11
1.62	n-octacosane	∿10
1.73	n-nonacosane	∿6

*Relative to the internal standard D-10 Anthracene.

TABLE F232. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #113178-WS-12 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.39	n-decane	78
0.39	impure C_3 alkylbenzene isomer	∿6000
0.40	C_9H_{10} isomer (tentative)	NQ
0.43	TMS-phenol	45
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.47	TMS derivatization artifact	
0.48	TMS derivatization artifact	
0.48	n-undecane	110
0.49	TMS derivatization artifact	
0.50	impure TMS-o-cresol	∿60
0.53	TMS derivatization artifact	
0.54	naphthalene	∿650
0.54	TMS derivatization artifact	
0.57	n-dodecane	220
0.58	TMS derivatization artifact	
0.60	TMS-dimethylphenol isomer	∿68
0.63	methylnaphthalene isomer	∿140
0.64	∿C_{13} alkane	∿64
0.65	methylnaphthalene isomer	∿21
0.66	n-tridecane	190
0.73	∿C_{14} alkane	∿29
0.75	n-tetradecane	193
0.79	∿C_{15} alkane	∿110
0.82	n-pentadecane	430
0.82	n-hexadecane	230
0.92	tri(TMS-ether)-triethanolamine (tentative)	NQ
0.93	∿C_{17} alkane	∿65
0.96	n-heptadecane	130
0.96	∿C_{18} alkane	∿34
0.98	∿C_{18} alkene	∿27
0.99	∿C_{18} alkene	∿64
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	42
1.09	∿C_{19} alkane	∿20
1.25	n-docosane	22
1.31	n-tricosane	25
1.35	n-tetracosane	45
1.40	n-pentacosane	58
1.45	n-hexacosane	56
1.52	n-heptacosane	∿60
1.59	n-octacosane	∿40

*Relative to the internal standard D-10 Anthracene.

TABLE F233. LAWRENCE LIVERMORE DERIVATIZED SAMPLE #11378-WS-12 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.34	C_9H_{12} isomer (tentative)	NQ
0.35	unknown	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	trimethylbenzene isomer	>20000
0.38	TMS derivatization artifact	
0.40	n-decane	40
0.40	trimethylbenzene isomer	>20000
0.41	C_4 alkylbenzene isomer	∿280
0.41	C_9H_{10} isomer (tentative)	NQ
0.42	C_9H_8 isomer (tentative)	NQ
0.43	mixture of C_3 and C_4 alkylbenzene isomers (tentative)	NQ
0.44	C_4 alkylbenzene isomer	∿190
0.44	TMS derivatization artifact	
0.45	C_4 alkylbenzene isomer	∿490
0.46	$C_{10}H_{12}$ isomer (tentative)	NQ
0.47	C_4 alkylbenzene isomer	∿180
0.47	methylbenzofuran isomer (tentative) +	NQ
0.48	TMS derivatization artifact	
0.49	methylbenzofuran isomer (tentative)	NQ
0.49	∿C_{11} alkane	∿130
0.49	C_4 alkylbenzene isomer	∿200
0.50	TMS derivatization artifact	
0.51	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.52	C_4 alkylbenzene isomer	∿1400
0.54	TMS derivatization artifact	
0.55	naphthalene	∿11000
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	dimethylbenzofuran isomer (tentative)	NQ
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.59	$C_{10}H_{12}$ isomer (tentative)	NQ
0.63	dimethylindan isomer (tentative)	NQ
0.64	methylnaphthalene isomer	∿2400
0.65	methylnaphthalene isomer	∿1100
0.66	∿C_{13} alkane	∿190
0.67	$C_{12}H_{16}$ isomer (tentative)	NQ
0.71	biphenyl	12
0.73	∿C_{14} alkane	∿51
0.73	dimethylnaphthalene isomer	∿120
0.74	dimethylnaphthalene isomer	∿179

(Continued)

TABLE F233. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.74	dimethylnaphthalene + n-tetradecane	∿780
0.76	C_2 alkylnaphthalene isomer	∿92
0.79	acenaphthene	∿250
0.80	∿C_{15} alkane	∿71
0.81	dibenzofuran	87
0.82	n-pentadecane	370
0.85	C_3 alkylnaphthalene isomer	∿85
0.87	C_3 alkylnaphthalene isomer	∿58
0.89	n-hexadecane	170
0.96	n-heptadecane	78
0.99	∿C_{18} alkene	∿64
1.00	D-10 ANTHRACENE	IS
1.02	n-octadecane	33
1.25	n-docosane	34
1.30	n-tricosane	38
1.35	n-tetracosane	81
1.40	n-pentacosane	110
1.46	n-hexacosane	91
1.53	n-heptacosane	∿95
1.61	n-octacosane	∿70
1.72	n-nonacosane	∿54

*Relative to the internal standard D-10 Anthracene.

TABLE F234. LAWRENCE LIVERMORE DERIVATIZED LIQUID CONDENSATE SAMPLE #01-12-77 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.44	TMS-phenol	>20000
0.49	TMS derivatization artifact	
0.50	TMS-o-cresol	14000
0.51	TMS-m-cresol	>20000
0.52	TMS-p-cresol	>20000
0.54	naphthalene + TMS derivatization artifact	∿4300
0.55	TMS-n-heptanoic acid	4100
0.58	TMS-C_2 alkylphenol isomer	∿640
0.59	TMS-dimethylphenol isomer	∿1100
0.60	TMS-ethylphenol isomer	∿2200
0.60	TMS-dimethylphenol isomer	∿3400
0.60	TMS-ethylphenol isomer	∿2000
0.61	TMS-dimethylphenol isomer	∿390
0.61	TMS-C_2 alkylphenol isomer	∿1400
0.62	TMS-n-octanoic acid	4400
0.67	methylnaphthalene isomer	∿390
0.73	TMS-n-nonanoic acid	2900
0.76	C_8 alkylphenol isomer	∿1400
0.77	n-tetradecane	3400
0.88	diethyl phthalate	2200
0.91	n-hexadecane	220
0.95	n-heptadecane	210
1.00	D-10 ANTHRACENE	IS
1.09	di-n-butyl phthalate	160
1.19	n-heneicosane	100
1.23	n-docosane	100
1.28	n-tricosane	140
1.32	n-tetracosane	170
1.37	n-pentacosane	140
1.42	n-hexacosane	190
1.48	n-heptacosane	∿150
1.55	n-octacosane	∿120

*Relative to the internal standard D-10 Anthracene.

TABLE F235. LAWRENCE LIVERMORE DERIVATIZED LIQUID CONDENSATE SAMPLE #01-12-77 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.44	TMS-phenol*	>20000
0.49	n-undecane*	>20000
0.51	TMS-o-cresol*	>20000
0.53	TMS-m-cresol	>20000
0.53	TMS-p-cresol	>20000
0.55	naphthalene	>20000
0.56	$C_{11}H_{14}$ isomer (tentative)	NQ
0.57	TMS-ethylphenol isomer	>20000
0.58	TMS-dimethylphenol isomer	>20000
0.59	TMS-dimethylphenol isomer	>20000
0.61	TMS-ethylphenol isomer	>20000
0.62	TMS-dimethylphenol isomer	>20000
0.63	TMS-C_2 alkylphenol isomer	>20000
0.64	methylnaphthalene isomer	>20000
0.65	TMS-C_3 alkylphenol isomer	∿19000
0.66	methylnaphthalene isomer	>20000
0.67	TMS-C_3 alkylphenol isomer	∿13000
0.67	n-tridecane + TMS-C_3 alkylphenol isomer	>20000
0.68	TMS-C_3 alkylphenol isomer	>20000
0.70	biphenyl	9600
0.73	C_8 alkylphenol isomer	∿20000
0.74	dimethylnaphthalene isomer	>20000
0.75	C_8 alkylphenol isomer	>20000
0.75	n-tetradecane	>20000
0.79	acenaphthene	∿18000
0.83	n-pentadecane	>20000
0.85	trimethylnaphthalene isomer	∿7800
0.86	fluorene	13000
0.87	diethyl phthalate + C_3 alkylnaphthalene isomer	>20000
0.90	n-hexadecane	∿17000
0.97	n-heptadecane	∿19000
0.97	∿C_{18} alkane	∿13000
1.00	$C_{14}H_{10}$ isomer	∿20000
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	11000
1.09	n-nonadecane	8700
1.15	n-eicosane	10000
1.16	$C_{16}H_{10}$ isomer	5400
1.18	$C_{16}H_{10}$ isomer	7200
1.20	n-heneicosane	9000
1.24	n-docosane	8400
1.31	n-tricosane	8100
1.36	n-tetracosane	6200

(Continued)

TABLE F235. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.41	n-pentacosane	8000
1.46	n-hexacosane	5100
1.53	n-heptacosane	∿4800
1.61	n-octacosane	∿2100
1.71	n-nonacosane	∿820

*Relative to the internal standard D-10 Anthracene.

TABLE F236. LAWRENCE LIVERMORE DERIVATIZED LIQUID CONDENSATE SAMPLE #30-10-77 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.43	TMS-phenol	>20000
0.51	TMS-o-cresol	>20000
0.52	TMS-m-cresol	>20000
0.53	TMS-p-cresol	>20000
0.54	naphthalene	∿6000
0.55	TMS-n-heptanoic acid	>20000
0.58	TMS-dimethylphenol isomer	∿8300
0.59	TMS-ethylphenol isomer	∿15000
0.59	TMS-dimethylphenol isomer	>20000
0.60	TMS-ethylphenol isomer	∿16000
0.62	TMS-C_2 alkylphenol isomer	∿7800
0.63	TMS-n-octanoic acid	>20000
0.71	TMS-n-nonanoic acid	∿19000
0.75	n-tetradecane	>20000
0.87	diethyl phthalate	>20000
1.00	D-10 ANTHRACENE	IS
1.31	n-tricosane	1520
1.35	n-tetracosane	1700
1.40	n-pentacosane	1300
1.46	n-hexacosane	1600

*Relative to the internal standard D-10 Anthracene.

TABLE F237. LAWRENCE LIVERMORE DERIVATIZED LIQUID CONDENSATE SAMPLE #30-10-77 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.44	TMS-phenol	>20000
0.51	TMS-o-cresol	>20000
0.52	TMS-m-cresol	>20000
0.53	TMS-p-cresol	>20000
0.54	naphthalene	>20000
0.56	TMS-ethylphenol isomer	>20000
0.57	TMS-dimethylphenol isomer	>20000
0.58	TMS-dimethylphenol isomer	>20000
0.61	TMS-ethylphenol isomer	>20000
0.62	TMS-dimethylphenol isomer	>20000
0.63	TMS-C_2 alkylphenol isomer	>20000
0.64	methylnaphthalene isomer	>20000
0.65	TMS-C_3 alkylphenol isomer	>20000
0.66	methylnaphthalene isomer	>20000
0.67	TMS-C_3 alkylphenol isomer	>20000
0.68	n-tridecane + TMS-C_3 alkylphenol isomer	>20000
0.69	TMS-C_3 alkylphenol isomer	>20000
0.71	biphenyl	5000
0.74	dimethylnaphthalene isomer	>20000
0.75	C_8 alkylphenol isomer	>20000
0.76	n-tetradecane	>20000
0.79	acenaphthene	~17000
0.83	n-pentadecane	17000
0.85	trimethylnaphthalene isomer	~7800
0.86	fluorene	11000
0.87	diethyl phthalate	>20000
0.90	n-hexadecane	18000
0.97	n-heptadecane	14000
0.99	$C_{14}H_{10}$ isomer	>20000
1.00	D-10 ANTHRACENE	IS
1.01	n-octadecane	11000
1.03	n-nonadecane	9700
1.09	n-eicosane	10000
1.15	$C_{16}H_{10}$ isomer	5700
1.16	$C_{16}H_{10}$ isomer	7000
1.19	n-heneicosane	10000
1.20	n-docosane	8900
1.26	n-tricosane	9700
1.36	n-tetracosane	8100
1.41	n-pentacosane	12000
1.46	n-hexacosane	7500
1.53	n-heptacosane	~8100

*Relative to the internal standard D-10 Anthracene.

TABLE F238. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-001 N.

Relative Retention Time (RRT)	Compound Identification	Concentration (ppb)
0.75	n-tetradecane	6
0.87	diethyl phthalate	97
0.90	n-hexadecane	<1
0.97	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	<1
1.09	n-nonadecane	<1
1.33	C_{24} alkane	<1
1.36	n-tetracosane	<1
1.41	n-pentacosane	<1

This sample contained nothing - no internal standard.

TABLE F239. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-001 B.

Relative Retention Time (RRT)	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.14	unknown	
1.40	unknown	
1.49	bis-(2-ethylhexyl)phthalate	∿34

This sample contained nothing - no internal standard.

TABLE F240. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-004 N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.75	n-tetradecane	10
0.87	diethyl phthalate	39
1.00	D-10 ANTHRACENE	IS
1.17	C_{21} alkane	∿1
1.25	n-docosane	<1
1.31	n-tricosane	<1
1.32	∿C_{24} alkane	∿1
1.36	n-tetracosane	2
1.38	C_{25} alkane	∿1
1.41	n-pentacosane	1
1.42	bis-(2-ethylhexyl)phthalate	∿14
1.44	C_{26} alkane	∿1
1.47	n-hexacosane	<1
1.51	C_{27} alkane	<1
1.53	n-heptacosane	<1
1.61	n-octacosane	<1

*Based on the internal standard D-10 Anthracene.

TABLE F241. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-004 B.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Based on the internal standard D-10 Anthracene.

TABLE F242. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-007 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Based on the internal standard D-10 Anthracene.

TABLE F243. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-007 N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.75	n-tetradecane	20
0.87	diethyl phthalate	86
0.97	n-heptadecane	<1
1.00	D-10 ANTHRACENE	IS
1.03	n-octadecane	<1
1.09	n-nonadecane	<1
1.10	di-n-butyl phthalate	<1
1.26	n-docosane	<1
1.31	n-tricosane	1
1.36	n-tetracosane	1
1.41	n-pentacosane	2
1.41	bis-(2-ethylhexyl)phthalate	∿3
1.46	n-hexacosane	1
1.63	n-heptacosane	<1
1.66	n-octacosane	<1
1.71	n-nonacosane	<1

*Based on the internal standard D-10 Anthracene.

TABLE F244. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-007 B.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Based on the internal standard D-10 Anthracene.

TABLE F245. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-010 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.75	n-tetradecane	11
0.87	diethyl phthalate	46
1.36	D-10 ANTHRACENE	IS
1.36	n-tetracosane	<1
1.41	n-pentacosane	<1

*Based on the internal standard D-10 Anthracene.

TABLE F246. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-010 N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.38	$C_8H_{11}N$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.48	bis-(2-ethylhexyl)phthalate	∿12

*Based on the internal standard D-10 Anthracene.

TABLE F247. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-010 B.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	d-4 p-dibromobenzene	IS
1.96	D-10 Anthracene	40

*Relative to the internal standard d-4 p-dibromobenzene.

TABLE F248. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-013 A.

Retention Time (minutes)	Compound Identification	Concentration (ppb)
10.2*	Cyclohexanol (tentative)	NQ
10.3	C_6 or C_7 alkane (tentative)	NQ
15.6	C_6H_9ClO isomer (tentative)	NQ
18.7	unknown	NQ
21.1	Unknown	
24.0	C_6H_{10} isomer (tentative)	NQ
25.0	Unknown	
26.8	$C_8H_{13}N$ isomer (tentative)	NQ
28.3	Unknown	

*An internal standard was not added to the sample. Rather than identifying the compounds' retention times relative to the internal standard, the retention times in minutes at which the compounds eluted have been noted.

TABLE F249. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-013 N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.23	column artifact	
0.26	~C_9 alkene	~3
0.75	n-tetradecane	22
0.87	diethyl phthalate	18
1.00	D-10 ANTHRACENE	IS
1.26	di-n-butyl phthalate	2
1.26	n-docosane	<1
1.31	n-tricosane	1
1.31	n-tetracosane	2
1.41	n-pentacosane	1
1.42	bis-(2-ethylhexyl)phthalate	~2
1.46	n-hexacosane	2
1.53	n-heptacosane	~2
1.61	n-octacosane	~2
1.71	n-nonacosane	~2

*Based on the internal standard D-10 Anthracene.

TABLE F250. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-013 B.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	d-4 p-dibromobenzene	IS
1.96	D-10 Anthracene	40

*Relative to the internal standard d-4 p-dibromobenzene.

TABLE F251. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-016 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.30	phenol	>20000
0.36	o-cresol	>20000
0.38	p-cresol	>20000
0.58	unknown	
0.67	unknown	
1.00	D-10 ANTHRACENE	IS

*Based on the internal standard D-10 Anthracene.

TABLE F252. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-016 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.29	phenol	>20000
0.36	o-cresol	100
0.39	p-cresol	>20000
0.45	dimethylphenol isomer	>20000
0.47	ethylphenol isomer	>20000
1.00	D-10 ANTHRACENE	IS

*Based on the internal standard D-10 Anthracene.

TABLE F253. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-019 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.30	phenol	120
0.36	o-cresol	90
0.39	p-cresol	330
0.45	ethylphenol isomer	∿8
0.45	dimethylphenol isomer	∿56
0.47	C_2 alkylphenol isomer	∿40
0.50	dimethylphenol isomer	∿12
1.00	D-10 ANTHRACENE	IS

*Based on the internal standard D-10 Anthracene.

TABLE F254. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-019 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.18	impure C_7H_9N isomer (tentative)	NQ
0.19	unknown	
0.26	C_6H_7N isomer (tentative)	NQ
0.28	unknown	
0.35	impure cresol isomer	∿12000
0.38	cresol isomer	>20000
0.40	impure dimethylphenol isomer	∿6800
0.44	dimethylphenol isomer	>20000
0.47	naphthalene	∿12000
0.47	impure C_3 alkylphenol isomer	∿19000
0.49	C_3 alkylphenol isomer	∿8600
0.52	unknown	
0.53	C_3 alkylphenol isomer	∿2600
0.56	C_3 alkylphenol isomer	∿4900
0.56	unknown	
0.57	C_8H_7N isomer (tentative)	NQ
0.58	methylnaphthalene isomer	∿820
0.59	methylnaphthalene isomer	∿650
0.64	unknown	
0.70	n-tetradecane	310
0.81	unknown	
1.00	$C_{14}H_{10}$ isomer	∿1200
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	340
1.12	n-nonadecane	240
1.15	unknown	
1.19	n-eicosane	310
1.26	n-heneicosane	380
1.32	n-docosane	390
1.38	n-tricosane	440
1.44	n-tetracosane	420
1.50	n-pentacosane	570
1.56	n-hexacosane	280

*Based on the internal standard D-10 Anthracene.

TABLE F255. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-022 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.30	phenol	>20000
0.37	o-cresol	>20000
0.38	p-cresol	>20000
0.46	dimethylphenol isomer	>20000
0.48	C_2 alkylphenol isomer	>20000
0.55	unknown	
0.57	C_3 alkylphenol isomer	>20000
0.90	$C_{14}D_{10}$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.51	air spike	
1.99	air spike	

*Based on the internal standard D-10 Anthracene.

TABLE F256. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-022 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.31	n-decane	>20000
0.41	n-undecane	>20000
0.47	naphthalene	>20000
0.51	n-dodecane	>20000
0.57	methylnaphthalene isomer	>20000
0.59	methylnaphthalene isomer	>20000
0.61	n-tridecane	>20000
0.66	biphenyl	>20000
0.68	$\sim C_{14}$ alkane + unknown	>20000
0.70	dimethylnaphthalene isomer	>20000
0.70	dimethylnaphthalene isomer	>20000
0.70	n-tetradecane	>20000
0.72	acenaphthylene	>20000
0.75	acenaphthene	>20000
0.76	$\sim C_{15}$ alkane	>20000
0.78	dibenzofuran	>20000
0.79	n-pentadecane	>20000
0.81	C_3 alkylnaphthalene isomer	>20000
0.82	C_3 alkylnaphthalene isomer	>20000
0.84	fluorene	>20000
0.85	C_3 alkylnaphthalene isomer	>20000
0.88	n-hexadecane	>20000
0.92	$C_{15}H_{18}$ isomer (tentative)	NQ
0.96	n-heptadecane	>20000
0.97	C_{18} alkane	>20000
0.99	$C_{14}H_{10}$ isomer	>20000
1.00	D-10 ANTHRACENE	IS
1.04	n-octadecane	>20000
1.12	n-nonadecane	>20000
1.12	unknown	
1.15	unknown	
1.18	n-eicosane	>20000
1.19	C_2 alkylphenanthrene isomer (tentative)	NQ
1.20	unknown	
1.26	n-heneicosane	>20000
1.32	n-docosane	>20000
1.38	n-tricosane	>20000
1.44	n-tetracosane	>20000
1.50	n-pentacosane	>20000
1.56	n-hexacosane	>20000
1.64	n-heptacosane	>20000
1.73	n-octacosane	>20000

*Based on the internal standard D-10 Anthracene.

TABLE F257. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-023 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.31	phenol	>20000
0.37	o-cresol	>20000
0.39	p-cresol	>20000
0.45	ethylphenol isomer	>20000
0.46	dimethylphenol isomer	>20000
0.48	C_2 alkylphenol isomer	>20000
0.49	air spike	
0.57	C_3 alkylphenol isomer	>20000
0.66	air spike	
1.00	D-10 ANTHRACENE	IS
1.03	air spike	
1.07	air spike	

*Based on the internal standard D-10 Anthracene.

TABLE F258. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #UCG-023 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.41	n-undecane	>20000
0.44	unknown mixture	
0.47	naphthalene	>20000
0.51	n-dodecane	>20000
0.52	C_{13} alkane	>20000
0.58	methylnaphthalene isomer	>20000
0.59	methylnaphthalene isomer	>20000
0.60	$\sim C_{13}$ alkene +	>20000
0.61	unknown	
0.61	n-tridecane	>20000
0.66	biphenyl	>20000
0.68	dimethylnaphthalene isomer + $\sim C_{14}$ alkane	>20000
0.70	dimethylnaphthalene isomer	>20000
0.70	dimethylnaphthalene isomer	>20000
0.70	n-tetradecane	>20000
0.72	acenaphthylene	>20000
0.75	acenaphthene	>20000
0.76	$\sim C_{15}$ alkane	>20000
0.78	C_3 alkylnaphthalene isomer	>20000
0.78	dibenzofuran	>20000
0.79		
0.80	n-pentadecane	>20000
0.81	C_3 alkylnaphthalene isomer	>20000
0.84	fluorene	>20000
0.84	C_3 alkylnaphthalene isomer	>20000
0.88	n-hexadecane	>20000
0.92	unknown	
0.96	unknown	
0.97	n-heptadecane	>20000
0.97	$\sim C_{18}$ alkane	>20000
0.99	unknown	
0.99	$C_{14}H_{10}$ isomer	>20000
1.00	D-10 ANTHRACENE	IS
1.04	$\sim C_{18}$ alkane	>20000
1.09	n-octadecane	>20000
1.12	unknown	
1.12	n-nonadecane	>20000
1.12	unknown	
1.15	unknown	
1.18	unknown	
1.19	n-eicosane	>20000
1.19	C_2 alkylphenanthrene isomer (tentative)	NQ
1.20	impure fluoranthene	>20000
1.23	pyrene	>20000
1.26	n-heneicosane	>20000

(Continued)

TABLE F258. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.31	unknown	
1.32	n-docosane	>20000
1.38	n-tricosane	>20000
1.45	n-tetracosane	>20000
1.50	n-pentacosane	>20000
1.56	n-hexacosane	>20000
1.64	n-heptacosane	>20000
1.73	n-octacosane	>20000
1.84	n-nonacosane	>20000

*Based on the internal standard D-10 Anthracene.

TABLE F259. LARAMIE ENERGY TECHNOLOGY CENTER
DERIVATIZED SAMPLE #III-2-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.59	TMS-ethylphenol isomer	∿290 ∿
0.59	TMS-dimethylphenol isomer	∿640
1.00	D-10 ANTHRACENE	IS
1.24	n-docosane	110
1.29	n-tricosane	130
1.34	n-tetracosane	240
1.39	n-pentacosane	270
1.45	n-hexacosane	370
1.52	n-heptacosane	∿250
1.61	n-octacosane	∿170

*Relative to the internal standard D-10 Anthracene.

TABLE F260. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-2-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	tetrachloroethylene (tentative)	NQ
0.49	dimethylphenol isomer	$\sim$13
0.54	dimethylphenol isomer	$\sim$25
0.56	dimethylphenol isomer	$\sim$27
0.64	C_3 alkylphenol isomer	$\sim$17
0.64	C_3 alkylphenol isomer	$\sim$12
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE F261. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-6-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	80
1.34	n-tetracosane	110
1.39	n-pentacosane	120
1.45	n-hexacosane	140
1.52	n-heptacosane	$\sim$130

*Relative to the internal standard D-10 Anthracene.

TABLE F262. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-6-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	tetrachloroethylene (tentative)	NQ
0.40	C_3 alkylbenzene isomer	∿7
0.52	$C_{10}H_{12}$ isomer (tentative)	NQ
0.65	$C_{11}H_{14}$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.11	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE F263. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-7-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.30	n-tricosane	660
1.34	n-tetracosane	970
1.40	n-pentacosane	1700
1.45	n-hexacosane	1200
1.52	n-heptacosane	∿1500
1.61	n-octacosane	∿880

*Relative to the internal standard D-10 Anthracene.

TABLE F264. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-7-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	tetrachloroethylene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE F265. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-8-7 A.

0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.24	n-docosane	50
1.29	n-tricosane	50
1.34	n-tetracosane	90
1.39	n-pentacosane	120
1.44	n-hexacosane	150
1.51	n-heptacosane	∿120
1.60	n-octacosane	∿70
1.71	n-nonacosane	∿40

*Relative to the internal standard D-10 Anthracene.

TABLE F266. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-8-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	tetrachloroethylene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.26	phthalate (tentative)	NQ
1.28	phthalate (tentative)	NQ
1.29	phthalate (tentative)	NQ
1.29	phthalate (tentative)	NQ
1.30	phthalate (tentative)	NQ
1.41	impure bis-(2-ethylhexyl)phthalate	∿56

*Relative to the internal standard D-10 Anthracene.

TABLE F267. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-9-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.43	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.53	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.28	n-tricosane	7
1.33	n-tetracosane	14
1.38	n-pentacosane	30
1.44	n-hexacosane	20
1.51	n-heptacosane	∿20
1.59	n-octacosane	∿2

*Relative to the internal standard D-10 Anthracene.

TABLE F268. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-9-7 B.N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.25	ethylbenzene	3
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE F269. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-10-7 A.

0.36	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.43	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.49	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.58	TMS derivatization artifact	
0.93	$C_{15}H_{39}O_3NSi_3$ isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.08	unknown	
1.17	TMS-n-hexadecanoic acid	170
1.17	TMS-$C_{18}H_{34}O_2$ acid isomer	∿35
1.28	TMS-n-octadecanoic acid	∿13
1.31	n-tricosane	4
1.36	n-tetracosane	6
1.41	n-pentacosane	10
1.46	n-hexacosane	15
1.53	n-heptacosane	∿9
1.60	n-octacosane	∿6
1.70	n-nonacosane	∿4

*Relative to the internal standard D-10 Anthracene.

TABLE F270. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-10-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.51	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.55	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.24	n-docosane	27
1.29	n-tricosane	36
1.34	n-tetracosane	56
1.39	n-pentacosane	88
1.45	n-hexacosane	98
1.52	n-heptacosane	∿98
1.61	n-octacosane	∿73
1.71	n-nonacosane	∿62
1.85	n-triacontane	∿48

*Relative to the internal standard D-10 Anthracene.

TABLE F271. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-11-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	40
1.34	n-tetracosane	80
1.39	n-pentacosane	100
1.45	n-hexacosane	130
1.52	n-heptacosane	∿80
1.61	n-octacosane	∿70

*Relative to the internal standard D-10 Anthracene.

TABLE F272. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-11-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	Tetrachloroethylene (tentative)	NQ
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE F273. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-12-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.47	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.55	TMS derivatization artifact	
0.58	TMS derivatization artifact	
0.78	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	460
1.34	n-tetracosane	1000
1.39	n-pentacosane	1200
1.45	n-hexacosane	1300
1.52	n-heptacosane	∿910
1.61	n-octacosane	∿800

*Relative to the internal standard D-10 Anthracene.

TABLE F274. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-12-7 B/N.

1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE F275. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-13-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	30
1.33	n-tetracosane	80
1.38	n-pentacosane	100
1.44	n-hexacosane	70
1.51	n-heptacosane	∼60
1.60	n-octacosane	∼50

*Relative to the internal standard D-10 Anthracene.

TABLE F276. LARAMIE ENERGY TECHNOLOGY CENTER SAMPLE #III-13-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE F277. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-14-7 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.47	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.58	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	110
1.34	n-tetracosane	160
1.39	n-pentacosane	220
1.45	n-hexacosane	170
1.52	n-heptacosane	∿160
1.60	n-octacosane	∿150

*Relative to the internal standard D-10 Anthracene.

TABLE F278. LARAMIE ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #III-14-7 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.45	TMS derivatization artifact	
0.52	TMS derivatization artifact	
0.55	TMS derivatization artifact	
0.56	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.33	n-tricosane	9
1.38	n-tetracosane	12
1.43	n-pentacosane	16
1.49	n-hexacosane	25
1.57	n-heptacosane	∿24
1.66	n-octacosane	∿18
1.77	n-nonacosane	∿18

*Relative to the internal standard D-10 Anthracene.

TABLE F279. GRAND FORKS ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #RA-18 PRODUCT TAR A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.39	TMS derivatization artifact	
0.44	TMS-phenol	>20000
0.45	TMS derivatization artifact	
0.46	TMS derivatization artifact	
0.50	TMS-o-cresol	>20000
0.51	TMS-m-cresol	>20000
0.53	TMS-p-cresol	>20000
0.54	TMS derivatization artifact	
0.57	TMS-C_2 alkylphenol isomer	>20000
0.58	TMS-dimethylphenol isomer	>20000
0.59	TMS-C_2 alkylphenol isomer	>20000
0.60	TMS-dimethylphenol isomer	>20000
0.61	TMS-ethylphenol isomer	>20000
0.62	TMS-dimethylphenol isomer	>20000
0.63	TMS-C_2 alkylphenol isomer	>20000
0.65	TMS-C_3 alkylphenol isomer	>20000
0.66	TMS-C_3 alkylphenol isomer	>20000
0.67	TMS-C_3 alkylphenol isomer	>20000
0.68	TMS-nitrosophenol isomer (tentative)	NQ
0.68	TMS-C_2 alkylphenol isomer + -C_3 alkylphenol isomer	>20000
0.69	di-t-butylphenol isomer	>20000
0.70	unknown	
0.74	di-t-butylphenol isomer	>20000
0.86	TMS-naphthol isomer (tentative)	NQ
0.93	TMS-methylnaphthol isomer (tentative)	NQ
1.00	D-10 ANTHRACENE	IS
1.25	n-docosane	>20000
1.30	n-tricosane	>20000
1.35	n-tetracosane	>20000
1.40	n-pentacosane	>20000
1.46	n-hexacosane	>20000
1.53	n-neptacosane	>20000
1.62	n-octacosane	>20000
1.73	n-nonacosane	>20000

*Relative to the internal standard D-10 Anthracene.

TABLE F280. GRAND FORKS ENERGY TECHNOLOGY CENTER
SAMPLE #RA-18 PRODUCT TAR N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.44	TMS-phenol	>20000
0.45	TMS derivatization artifact	
0.51	TMS derivatization artifact	
0.52	TMS-o-cresol	>20000
0.53	TMS-m-cresol	>20000
0.53	TMS-p-cresol	>20000
0.54	TMS derivatization artifact	
0.55	naphthalene	>20000
0.60	unknown	
0.60	TMS-dimethylphenol isomer	>20000
0.61	TMS-dimethylphenol isomer	>20000
0.62	TMS-dimethylphenol isomer	>20000
0.63	TMS-dimethylphenol isomer	>20000
0.69	TMS-isopiophylphenol isomer	>20000
0.76	n-tetradecane	>20000
1.00	D-10 ANTHRACENE	IS
1.21	phthalate, $(C_6H_4\text{-}1,2\text{-}(CO_2C_8H_{17})_2)$ isomer	>20000
1.22	phthalate, $(C_6H_4\text{-}1,2\text{-}(CO_2C_8H_{17})_2)$ isomer	>20000
1.39	phthalate, $(C_6H_4\text{-}1,2\text{-}(CO_2C_8H_{17})_2)$ isomer	>20000
1.44	unknown	
1.52	unknown	
1.55	unknown	
1.69	unknown	

*Relative to the internal standard D-10 Anthracene.

TABLE F281. GRAND FORKS ENERGY TECHNOLOGY CENTER
SAMPLE #RA-18 PRODUCT TAR B.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.25	ethylbenzene	>20000
0.26	p-xylene	>20000
0.28	C_8H_8 isomer (tentative)	NQ
0.28	o-xylene	>20000
0.35	C_3 alkylbenzene isomer	>20000
0.36	C_3 alkylbenzene isomer	>20000
0.37	benzofuran (tentative)	NQ
0.38	trimethylbenzene isomer	>20000
0.39	decene	>20000
0.40	n-decane	>20000
0.40	trimethylbenzene isomer	>20000
0.42	C_9H_8 isomer (tentative)	NQ
0.48	C_9H_8O isomer (tentative)	NQ
0.49	methylbenzofuran isomer (tentative)	NQ
0.49	undecene	>20000
0.50	n-undecane	>20000
0.52	methylindene isomer (tentative)	NQ
0.53	methylindene isomer (tentative)	NQ
0.55	naphthalene	>20000
0.58	dodecene	>20000
0.58	dimethylbenzofuran isomer (tentative)	NQ
0.59	n-dodecane	>20000
0.65	methylnaphthalene isomer	>20000
0.66	methylnaphthalene isomer	>20000
0.66	tridecene + unknown	>20000
0.67	n-tridecane	>20000
0.70	$C_{13}H_{18}$ isomer (tentative)	NQ
0.71	biphenyl	>20000
0.74	dimethylnaphthalene isomer	>20000
0.75	tetradecene	>20000
0.75	dimethylnaphthalene isomer	>20000
0.75	dimethylnaphthalene isomer	>20000
0.75	n-tetradecane	>20000
0.77	acenaphthylene	>20000
0.77	dimethylnaphthalene isomer	>20000
0.79	acenaphthene	>20000
0.79	methylbiphenyl isomer (tentative)	NQ
0.80	C_{15} alkane	>20000
0.82	dibenzofuran	>20000
0.82	pentadecene	>20000
0.83	impure $C_{13}H_{16}O$ isomer (tentative)	NQ
0.85	C_3 alkylnaphthalene isomer	>20000
0.86	C_3 alkylnaphthalene isomer	>20000

(Continued)

TABLE F281. (Continued)

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.87	fluorene	>20000
0.88	C_3 alkylnaphthalene isomer	>20000
0.90	hexadecene	>20000
0.90	n-hexadecane	>20000
0.90	$C_{13}H_{10}$ isomer (tentative)	NQ
0.94	$\sim C_{17}$ alkane (tentative) + $C_{15}H_{18}$ isomer (tentative)	NQ
0.96	heptadecene	>20000
0.97	n-heptadecane	>20000
0.99	$\sim C_{19}$ alkene	>20000
0.99	$C_{14}H_{10}$ isomer	>20000
1.00	D-10 ANTHRACENE	IS
1.03	octadecene	>20000
1.04	n-octadecane	>20000
1.08	nonadecene	>20000
1.09	n-nonadecane	>20000
1.14	eicosene	>20000
1.15	n-eicosane	>20000
1.16	fluoranthene	>20000
1.19	pyrene + $C_{20}H_{28}$ isomer (tentative)	>20000 NQ
1.20	heneicosene	>20000
1.20	n-heneicosane	>20000
1.21	docosene	>20000
1.25	n-docosane	>20000
1.30	tricosene	>20000
1.30	n-tricosane	>20000
1.35	tetracosene	>20000
1.35	n-tetracosane	>20000
1.40	pentacosene	>20000
1.40	n-pentacosane	>20000
1.41	bis-(2-ethylhexyl)phthalate	>20000
1.46	hexacosene	>20000
1.46	n-hexacosane	>20000
1.53	heptacosene	>20000
1.53	n-heptacosane	>20000
1.61	octacosene	>20000
1.62	n-octacosane	>20000
1.72	noancosene	>20000
1.73	n-nonacosane	>20000
1.85	triacontene	>20000
1.86	n-triacontane	>20000

*Relative to the internal standard D-10 Anthracene.

TABLE F282. GRAND FORKS ENERGY TECHNOLOGY CENTER DERIVATIZED SAMPLE #RA-18 PRODUCT LIQUOR A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.35	TMS derivatization artifact	
0.36	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.37	TMS derivatization artifact	
0.38	TMS derivatization artifact	
0.43	TMS-phenol	>20000
0.45	TMS derivatization artifact	
0.50	TMS derivatization artifact	
0.50	TMS-o-cresol	>20000
0.51	TMS-m-cresol	>20000
0.52	TMS-p-cresol	>20000
0.53	TMS derivatization artifact	
0.54	TMS derivatization artifact	
0.58	unknown	
0.62	TMS-n-octanoic acid	>20000
0.67	TMS derivatization artifact	
0.71	TMS-n-nonanoic acid	>20000
0.73	TMS derivatization artifact	
0.74	TMS derivatization artifact	
0.78	TMS derivatization artifact	
0.79	TMS derivatization artifact	
0.98	TMS derivatization artifact	
1.00	D-10 ANTHRACENE	IS
1.29	n-tricosane	>20000
1.34	n-tetracosane	>20000
1.39	n-pentacosane	>20000
1.45	n-hexacosane	>20000
1.52	n-heptacosane	>20000
1.61	n-octacosane	>20000

*Relative to the internal standard D-10 Anthracene.

TABLE F283. GRAND FORKS ENERGY TECHNOLOGY CENTER SAMPLE #RA-18 PRODUCT LIQUOR B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.27	C_6H_7N isomer	~18000
0.31	unknown	
0.39	phenol	>20000
0.44	o-cresol	>20000
0.47	o-methoxyphenol (tentative)	NQ
0.48	p-cresol	>20000
0.48	dimethylphenol isomer	~6900
0.52	ethylphenol isomer	>20000
0.53	dimethylphenol isomer	>20000
0.55	C_2 alkylphenol isomer	>20000
0.56	unknown	
0.57	C_2 alkylphenol isomer	~12000
0.60	C_3 alkylphenol isomer	~2800
0.61	C_3 alkylphenol isomer	~5200
1.00	D-10 ANTHRACENE	IS
1.41	bis-(2-ethylhexyl)phthalate	~3100

*Relative to the internal standard D-10 Anthracene.

TABLE F284. PITTSBURGH ENERGY TECHNOLOGY CENTER HG-9 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS
1.09	unknown phthalate	

*Relative to D-10 Anthracene.

TABLE F285. PITTSBURGH ENERGY TECHNOLOGY CENTER HG-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to D-10 Anthracene.

TABLE F286. PITTSBURGH ENERGY TECHNOLOGY CENTER HG-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.94	noise spike	
1.00	D-10 ANTHRACENE	IS
1.10	unknown phthalate	
1.42	bis-(2-ethylhexyl)phthalate	9300

*Relative to D-10 Anthracene.

TABLE F287. PITTSBURGH ENERGY TECHNOLOGY CENTER HG-9 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.21	tetrachloroethylene (tentative)	NQ
0.26	xylene (tentative)	NQ
0.82	air spike	
1.00	D-10 ANTHRACENE	IS
1.13	air spike	
1.42	bis-(2-ethylhexyl)phthalate	1300

*Relative to D-10 Anthracene.

APPENDIX G
ORGANIC AND INORGANIC COMPONENTS IDENTIFIED IN EFFLUENT SAMPLES
GEOTHERMAL ENERGY PRODUCTION - SAMPLE LIST

Organization	Site	Sample description	Sample code
Battelle Northwest/ ERDA	Imperial Valley, CA	Water sample from East Mesa Geothermal Test Site collected July 1978	GRR-1
Battelle Northwest/ ERDA	Salton Sea, CA	Water sample from Woolsey Well #1 collected August 1977	GRR-2

TABLE G1. MERCURY RESULTS FOR GEOTHERMAL ROUND ROBIN SAMPLES

Method	Concentration (ppm Hg)
Sample GRR1	
Cold Vapor-GSRI	<0.002
Cold Vapor-Other	0.001
	0.0004
	<0.002
	0.0006
	<0.1
	0.0028
X-ray Fluorescence	Not Detected
Neutron Activation	<0.010
Sample GRR2	
Cold Vapor-GSRI	<0.002
Cold Vapor-Other	0.005
	0.0009
	0.002
	0.002
Neutron Activation	<0.010
Emission Spectroscopy	Not Detected

TABLE G2. GRR-1 ROUND ROBIN RESULTS - GSRI

Parameter	Method	GRR-1 Control (Given)	Results[#]				
			GRR-1 Control	RU	FU	FA-HCl	FA-HNO_3
Alkalinity[†] (ppm)	Potentiometric Titration	*	*	*	493	*	*
Ammonia-N (ppm)	Electrode	14	7.8	*	*	9 9	*
Barium (ppm)	AAS**	0 3	0 3	*	*	0.3	*
Calcium (ppm)	AAS	13.0	13.9	*	*	12.8	*
Chloride (ppm)	Mercuric Nitrate	*	*	*	34	*	*
Conductivity (μmho/cm)	Potentiometric	*	*	6840	*	*	*
Copper (ppm)	AAS	0.08	0.08	*	*	<0.04	<0.04
Fluoride (ppm)	Electrode	1.2	0.5	*	3.0	*	*
Hardness (ppm)	Titration (Univar hardness reagent)	*	*	*	*	38	*
Iron (ppm)	AAS	0.7	0.7	*	*	0.2	0.2
Lead (ppm)	AAS	0.30	0.4	*	*	<0.3	*
Manganese (ppm)	AAS	0.06	0.06	*	*	<0.03	*
Magnesium (ppm)	AAS	0.20	0.21	*	*	0.32	0.32
pH	Potentiometric	*	*	6.5	*	*	*
Potassium (ppm)	AAS	180	160	*	*	117	*
Silver (ppm)	AAS	0.07	<0.01	*	*	<0.01	<0.01
Sulfate (ppm)	AAS	150	148	*	*	170	*
Sulfide (ppm)	Methylene blue	*	*	*	<0.05	*	*
Sodium (ppm)	AAS	1500	1200	*	*	970	*
Solids, TSS (ppm)	Gravimetric	*	*	9	3	*	*
Strontium (ppm)	AAS	1.6	1.6	*	*	2.1	*
Zinc (ppm)	AAS	0.60	0.55	*	*	<0.01	*

[†] 2N NaOH, GRR-1 background alkalinity: 105 mg/ml.

[*] Analysis not applicable to this sample.

[**] Atomic Absorption Spectrometry

[#] RU-Raw unfiltered
FU-Filtered unacidified
FA-Filtered acidified

TABLE G3. GRR-2 ROUND ROBIN RESULTS

Parameter	Method	GRR-2 Control	GRR-2 Woolsey #1
Alkalinity (ppm)	Potentiometric Titration	ND	ND
Aluminum	AAS	ND	0.3
Ammonia-N (ppm)	Electrode	ND	139
Arsenic (ppm)	AAS	0.8	17
Barium (ppm)	AAS	59	97
Boron (ppm)	SSMS	-	20
Calcium (ppm)	AAS	-	2.4×10^3
Chloride (ppm)	Mercuric Nitrate	-	1.3×10^4
Copper (ppm)	AAS	-	1
Iron (ppm)	AAS	104	262
pH		-	4.3
Sodium (ppm)	AES	1.5×10^4	3×10^4

TABLE G4. SSMS DATA FOR GEOTHERMAL ROUND ROBIN SAMPLE GRR-1

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.06	Fluorine	≈4	Neodymium	<0.001	Strontium	6
Antimony	<0.001	Gadolinium	<0.001	Nickel	0.02	Sulfur	MC
Arsenic	0.9	Gallium	0.001	Niobium	≤0.004	Tantalum	<0.001
Barium	0.3	Germanium	0.04	Osmium	<0.001	Tellurium	<0.001
Beryllium	≤0.001	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	MC	Thallium	<0.001
Boron	0.6	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	0.1	Indium	STD	Potassium	MC	Thulium	<0.001
Cadmium	<0.001	Iodine	<0.001	Praseodymium	≤0.002	Tin	≤0.004
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	1
Cerium	0.003	Iron	0.7	Rhodium	<0.001	Tungsten	≤0.008
Cesium	0.2	Lanthanum	0.004	Rubidium	1	Uranium	<0.001
Chlorine	MC	Lead	≤0.007	Ruthenium	<0.001	Vanadium	0.04
Chromium	0.05	Lithium	5	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.003	Lutetium	<0.001	Scandium	0.002	Yttrium	<0.001
Copper	0.05	Magnesium	MC	Selenium	≤0.03	Zinc	0.03
Dysprosium	<0.001	Manganese	0.04	Silicon	MC	Zirconium	0.003
Erbium	<0.001	Mercury	NR	Silver	0.07		
Europium	<0.001	Molybdenum	0.02	Sodium	>4		

NR-Not Reported

Sample was ashed @ 350°C for one hour in a laboratory furnace in a quartz crucible prior to analysis.

MC-Major Component

TABLE G5. SSMS DATA FOR GEOTHERMAL ROUND ROBIN SAMPLE GRR-2

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Aluminum	0.3	Fluorine	≈25	Neodymium	<0.001	Strontium	MC
Antimony	≤0.5	Gadolinium	<0.001	Nickel	INT	Sulfur	33
Arsenic	17	Gallium	≤0.04	Niobium	<0.001	Tantalum	<0.001
Barium	87	Germanium	<0.001	Osmium	<0.001	Tellurium	<0.001
Beryllium	0.004	Gold	<0.001	Palladium	<0.001	Terbium	<0.001
Bismuth	<0.001	Hafnium	<0.001	Phosphorus	0.2	Thallium	≤0.2
Boron	20	Holmium	<0.001	Platinum	<0.001	Thorium	<0.001
Bromine	56	Indium	STD	Potassium	MC	Thulium	0.2
Cadmium	<0.001	Iodine	0.4	Praseodymium	<0.001	Tin	<0.001
Calcium	MC	Iridium	<0.001	Rhenium	<0.001	Titanium	0.2
Cerium	<0.001	Iron	78	Rhodium	<0.001	Tungsten	<0.001
Cesium	5	Lanthanum	≤0.7	Rubidium	56	Uranium	<0.001
Chlorine	MC	Lead	6	Ruthenium	<0.001	Vanadium	0.5
Chromium	0.09	Lithium	>91	Samarium	<0.001	Ytterbium	<0.001
Cobalt	≤0.02	Lutetium	<0.001	Scandium	≤0.02	Yttrium	≤0.02
Copper	0.9	Magnesium	MC	Selenium	0.5	Zinc	28
Dysprosium	<0.001	Manganese	MC	Silicon	28	Zirconium	0.09
Erbium	<0.001	Mercury	NR	Silver	<0.001		
Europium	<0.001	Molybdenum	2	Sodium	MC		

NR-Not Reported

MC-Major Component

INT-Interference

TABLE G6. GEOTHERMAL ROUND-ROBIN SAMPLE GRRL VOA.

Retention time (scan numbers)	Compound Identification	Concentration (ppb)
65*	methylene chloride	32
138	chloroform	14
256	benzene	500
285	unknown	
385	toluene	17
542	unknown	

*An internal standard was not added to the sample. Quantifications were based upon the standard runs. Rather than identifying the compounds' retention times relative to the internal standard, the scan numbers at which the compounds eluted have been noted.

TABLE G7. GEOTHERMAL ROUND-ROBIN SAMPLE GRR-2 VOA.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.15	methylene chloride	110
0.20	blank contaminant	
0.27	chloroform	2
0.42	dimethylamine	NQ
0.94	benzene	1
1.00	1,2-DIBROMOETHANE	IS
1.56	toluene	<1

*Relative to the internal standard 1,2-Dibromoethane.

TABLE G8. GEOTHERMAL ROUND-ROBIN SAMPLE GRR-1 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.32	phenol	200
0.54	unknown	
0.65	blank contaminant	
0.73	unknown	
0.84	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE G9. GEOTHERMAL ROUND-ROBIN SAMPLE GRR-1 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.55	unknown	
0.74	$C_{10}H_{12}O_3$ isomer	NQ
0.76	unknown	
0.77	unknown	
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE G10. GEOTHERMAL ROUND-ROBIN SAMPLE GRR-2 A.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
1.00	D-10 ANTHRACENE	IS

*Relative to the internal standard D-10 Anthracene.

TABLE G11. GEOTHERMAL ROUND-ROBIN SAMPLE GRR-2 B/N.

Relative Retention Time (RRT)*	Compound Identification	Concentration (ppb)
0.81	$C_{10}H_{12}$ isomer	NQ
1.00	D-10 ANTHRACENE	IS
1.41	unknown	

*Relative to the internal standard D-10 Anthracene.